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ABSTRACT

This final report presents results of the first phase of an effort to develop in detail the resource requirements, operating procedures, and estimated costs for several centralized braille service options at the Library of Congress. Existing procedures and services were analyzed, and three models for centralized braille services were formulated. Option A, chosen by the study advisory committee as most likely to be successful, would consist of a comprehensive centralized service with reader advisory services at the centers, an Interactive Voice Response (IVR) feature, and telecommunications data link to local libraries. Options B and C would consist of reader advisory services and a profile selection circulation resident at the network library level, with a telecommunications link between the libraries--and the centers. In Option B, patrons could contact centers directly to place specific orders through clerks or the IVR, but Option C would not have these features. Centralized services would consist of two central distribution centers, an eastern center located in Cincinnati, Ohio serving all states and territories east of the Mississippi River together with the states of Louisiana, Arkansas, and Missouri and a western center located in Salt Lake City, Utah, serving all other states and territories. Resource requirements and operating procedures, were designed in the light of various expressed goals, including: a one-day service response time; voice communications access to the centers (Options A and B); and two-way transfer of data between libraries (all options). Costs for all resources are quantified and summarized and automatic data processing design features are described. Costs are constructed with estimated total costs for current network braille operations, with the costs for Option A being calculated on the assumption that 100% of reader advisory services are centrally provided. Reasons for the significant net cost savings realized by Option A are described. Twenty-five exhibits are included, and 38 appendixes provide operating details, primarily in tabular form. (SLD)

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STUDY I, PART 1

FINAL REPORT

OPTIONS FOR BRAILLE CENTRALIZATION

Contract Number I70251

ManTech Technical Services Corporation

and

Wesley-Kind Associates, Inc.

January 22, 1993

This work was sponsored by the National Library Service for the Blind and Physically Handicapped, the Library of Congress.

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FINAL REPORT

STUDY I, PART 1

Submitted to:

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PHYSICALLY
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For:

STUDY I -
IMPLEMENTATION STUDY
OF CENTRALIZED
BRAILLE BOOK
STORAGE AND
DISTRIBUTION SYSTEM

PART 1 -
OPTIONS FOR
BRAILLE
CENTRALIZATION

In response to:

CONTRACT NUMBER I70251

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EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

The National Library Service for the Blind and Physically Handicapped (NLS), The Library of Congress, awarded a contract to ManTech Technical Services Corporation (ManTech) to perform an implementation study of centralized braille book storage and distribution systems. This final report presents the results of the first phase of this effort, which was to develop in detail the resource requirements, operating procedures, and estimated costs for several centralized braille service options. All facets of centralized service were to be addressed, including automation requirements, facilities, staffing and any other relevant aspects of such operations. The analysis was furthermore to incorporate operational goals and patron and network concerns about centralized service into the design of the systems, take into account any standards that would apply to such operations, and to assess the direct impacts on patrons, multistate centers (MSCs), the network, NLS, and the USPS.

Outside the scope of the study were: the costs of acquiring braille books by NLS; the costs of transportation and processing incurred by the USPS; how centralized service would be funded if implemented; the redeployment of resources, and/or the funds for resources, that would be "freed up" by centralizing the service; the storage and distribution of non-NLS owned braille collections; internal concerns of a political nature; and the flexibility of network participation in centralized service.

The study began with an orientation session that familiarized all study team members with NLS and network braille operations. The reports from the previous feasibility studies were subsequently reviewed. Then a series of four site visits to three regional libraries and one multistate center were conducted to determine what services are currently being provided, what resources are deployed, and what operating procedures are followed to provide existing braille services to patrons of the network. The first meeting with the study advisory committee was held June 4 and 5, 1992, during which network and patron concerns about braille centralization were expressed, and during which three models for centralized braille services were formulated. Analyses of all three defined options were then conducted, in which the workload for each option was defined, the best methods for work performance were determined, the resources to be

deployed were quantified, and the costs of operations were projected over a five-year time frame. A second meeting with the advisory committee was held October 13 and 14, 1992, during which the draft report was reviewed, several changes were made to the options, and one option, described below, was selected as the preferred centralized braille services system.

Three options were evaluated and examined in the study, and for all three options the following assumptions hold: 1) books and back issues of magazines would generally be stored in, and distributed from, the centers, although some partial or complete collections could remain in some regional libraries (to be determined at a later date by NLS and the network); 2) initial registration of patrons with the free national library service would remain a network library responsibility except for the registration with the centralized system of braille readers who reside in states/regions whose network libraries choose not to participate in centralized services; and, 3) ADP systems at the centers would manage and track only NLS collections, not local collections.

Option A, chosen by the committee as the model most likely to be successful, would consist of a comprehensive centralized service, which would include reader advisory (RA) services at the centers, profile select book circulation at the centers, direct patron access via an Interactive Voice Response (IVR) feature, and a telecommunications data link provided to facilitate the provision of RA services locally, if a library so chooses. Options B and C would consist of reader advisory services and profile select circulation being resident at the network library level, with a telecommunications data link between the libraries and the centers for placement of orders, queries and file maintenance tasks. In Option B, patrons could also directly contact the centers to place specific orders via order clerks or via the IVR, while Option C would have neither of these features.

Centralized braille services would consist of two central distribution centers, an eastern center located in Cincinnati, Ohio, serving all states and territories east of the Mississippi River, together with the states of Louisiana, Arkansas, and Missouri, and a western center located in Salt Lake City, Utah, serving all other U.S. states and territories. The special case of service to Hawaii was addressed, and it is recommended that Hawaii participate in centralized service and that an expedited delivery method be employed. The systems designed are free-standing, integrated distribution facilities employing modern technological features vis-a-vis information support and inventory control, and in full compliance with OSHA standards, industrial standards

and the Americans with Disabilities Act (ADA). The centers would store and distribute only braille, and there would initially be no weeding of the BR collections consolidated from network libraries, although weeding would occur on a title-by-title basis after a circulation history is developed at the centers. The facilities are not designed for browsing, but walk-in service and tours of the facility are recommended features.

The eastern center would handle approximately two-thirds of national readership and circulation, while the western center would handle the needs of approximately one-third of national readership and circulation, and additionally the needs of all readers with regard to several special collections. The recommended configurations consist of a central, primary center (designated herein as the western center... to be determined subsequently in the transition plan) wherein the central ADP system would be located, and reader advisors, or order clerks, would be located in Options A and B, respectively. The eastern center would physically house and distribute approximately two-thirds of the BR collection, two-thirds of the regular BRA collection, two-thirds of the BRF collection and one-half of the back issue magazine collection, while the western center would house and distribute the remainder of the above collections, the pre-13000 BRA collection, the BRJ collection, and the BRX collection, and would house the BRA masters. These configurations were derived considering minimizing risk to the collections, balance of collections with readership and circulation, delivery time of materials to patrons, and load leveling of work between facilities.

The resource requirements and operating procedures recommended for the centers were designed considering various expressed goals including: a one-day service response time; full reader advisor support; free, minimal-waiting, voice communications access to the centers (Options A and B); two-way transfer of data between libraries and centers (all options); OSHA, ALA and ADA standards (where applicable); and, reporting requirements to NLS and/or the network. Careful analyses were performed to estimate the requirements for telecommunications and associated costs. The use of bar coding system technology for efficient inventory control and expediting postal deliveries is recommended. The impact of centralization on postal delivery times is presented, and it appears feasible that quicker turnaround in the centers will almost negate the incremental increase in delivery times due to longer average transits. Four policy

questions are posed to NLS and the advisory committee regarding centralized operations: 1) establishment of a book loan limit; 2) establishment of a book loan period; 3) possible separate rules for institutions; and 4) the status of very large braille books, especially reference books, vis-a-vis an allocation among the centers and network libraries.

Detailed descriptions of resource requirements and operating procedures were developed for each of the options evaluated; in many instances, the requirements and procedures were similar, especially with regard to floor operations, which were virtually identical under all options. Facility sizes and configurations are presented in the report: the eastern center is approximately 27,500 sf and the western center approximately 18,500 sf. The configurations of the structures are such that they are modularly expandable. It is recommended that mobile shelving, with 10-level storage height, be employed and the economies of such an investment are presented. It is also recommended that random storage be employed, and the justification for it i.e., at least a 20% savings in facility space, are presented.

Facility operating schedules are designed to provide 8:00AM - 5:00PM coverage of all time zones in the continental U.S., and designed to ship virtually all orders the day they are received. It is recommended that separate postal deliveries to, and pickups from, the centers be established with the USPS (already agreed to by the USPS bulk mail facility in Salt Lake City).

The operations will use a forward shelving ("quick turn") feature, whereby it is estimated that approximately 60% of circulated volumes would not have to be put away in the stacks. Distribution operations are oriented around the use of radio frequency, hand held bar code scanners for expediting receiving, putaway, inventory control, pulling and issuing tasks, which would also minimize error rates in all of the functions. All volumes of braille in all collections, and all shelf locations, would be bar coded with unique identifiers. Fast moving titles would be stored in the 7 lower tiers of the shelves, and slow movers/archives would be stored on the upper tiers. There would be three order filling cycles per day in Option A, and two per day under Options B and C. In all options, reserves take priority over requests, and requests take priority over profile selected picks. Hand carts would be used to carry volumes to and from the stacks, and pick tickets would consist of serially numbered, location sequenced cards that serve as both

pick ticket and address label. A transaction bar code on these tickets would be scanned as a final verification check just prior to issuance.

Office operations at the primary site would consist of a manager, ADP staff, and clerical staff for all options, and would also include reader advisors in Option A. Office operations at the secondary site would consist of a manager and clerical staff for all options. In Option A, the reader advisors would perform all functions currently provided by network libraries offering braille service with the exception of initial registration and verification of eligibility of patrons from participating states, but would register patrons from non-participating states who desire enrollment in the centralized services. Clerical staff would provide general support in Options A and C, and would additionally take direct orders from patrons for specific titles under Option B. The manager at the primary site would be the overall manager of centralized services, while the manager at the secondary site would be essentially a working supervisor.

As previously mentioned, the main ADP system containing the majority of the information would be located at one site as opposed to using two processors, one at each location. This main, or primary system, would be linked to two sub-system servers, one each at the eastern and western centers. The primary site sub-system would be linked to the primary system via a LAN, whereas the secondary site sub-system would be connected by modem.

The primary ADP system would be designed as a fault tolerant system, which means that there would be twin ADP processors performing identical processing functions. These systems would possess indistinguishable characteristics such as CPUs, hardware configurations, memory storage capability, network communication features, and separate backup power supplies. This approach would provide system redundancy and ensure that data would not be lost, and patron service impaired, due to a hardware failure. This duplicate processing approach would also be applied at the sub-system level. However, these systems would not operate in tandem. Each sub-system server would instead have a backup server configured in the same fashion with an auxiliary power supply. This configuration would provide fail-safe processing without interruption to the floor operations.

The ADP processing approach is basically the same for each option with minimal differences that relate to who will have access to the primary system and how that entry would be accomplished. Options A and B provide patrons with a direct access utility which would permit the patrons to order books by means of a touch tone telephone. This function would be made possible by use of an Interactive Voice Response (IVR) that would interact with the patron and the database thus creating a book transaction, and would have a direct connect to the primary system. All options would provide direct database access to NLS and the regional libraries via a communication hub such as SPRINT NET. Option C would provide the same data telecommunications access capability as Options A and B, with the exception that patrons could not call into the primary system via the IVR.

The database was sized using the data fields currently contained in existing databases supporting the NLS network. Where appropriate, additional data fields were added to accommodate the unique characteristics of the centralized braille application. Based upon these data fields developed, the primary system database would contain 108 megabytes under Option A and 71 megabytes for Options B and C. The sub-system databases would be sized at 12 megabytes for the west and 18 megabytes for the east. The relatively small size of the sub-systems is due to a minimal amount of data being stored there, i.e., title/volume identification and shelf location only. These size estimates should not be construed as total memory/storage requirements; additional memory would be required to accommodate system and database software.

Several ADP systems in use in the NLS network were examined to identify automated capabilities which were considered necessary to the centralized braille application. It was determined that the system must be user friendly and menu driven. The design should provide for utilities which would allow a profile select capability (for Option A), provide a patron history (Has Had), allow books requested but not in stock to be placed on a patron reserve list, incorporate the use of bar coding, provide a function for same-day turnaround of returned books, support random storage, and support a patron telephone ordering system (Direct Access) to the primary system. These capabilities are essential to providing a level of patron service commensurate with or in excess of existing services.

Off-the-shelf software was explored along with relevant aspects of existing services of custom software. Four library software programs were considered to be off-the-shelf as they were utilized by multiple regional libraries; Data Research (DRA), READS, Penn/Jersey and Keystone Library Automation System (KLAS). Three of the four use a hierarchial database design, while KLAS uses a relational database approach. Although all four are tested performers in the NLS network, none of the four provide an exact fit to the centralized distribution application. However, each application could be modified to accomplish the necessary functions. The extent to which this is feasible can only be determined by means of a thorough examination of the utilities and source codes of these software packages. The key to this decision is to determine which software program is more flexible and receptive to change.

The centralized braille ADP system must be supported by a database design which provides for flexibility and versatility in the database structure and actual code. This application should be able to be modified with minimal impact on surrounding data and file organization. The software to support this centralized braille system could be constructed by means of a customized software package specifically designed to the specifications resulting from this study. This process would negate the dependence on proprietary software, but would increase the implementation time for centralized braille services to be operational. Custom software development would be much more adaptable to an in-house maintenance concept.

Requirements and costs for all resources are quantified and summarized in the report. The most significant startup costs are for: facility construction ($1,740,000 to build and buy, or $174,000 per year to lease); equipment for storage and distribution functions (approximately $4,000,000 if bought, or $400,000 per year if leased); and collection conversion (approximately $225,000 over a five-year time frame)... this assumes that *all* NLS owned braille would be managed by the centers, and there would be no weeding prior to consolidation. The largest annually recurring cost would be for labor ($584,000 Option A; $406,000 Options B and C). The impacts on MSCs, NLS and regional libraries are also addressed in the report. It was determined that the existing MSC facilities are unsuitable for the envisioned operations, and the incremental impact of centralization of braille is presented with respect to facility space and labor.

Recommendations regarding possibilities for inclusion of other items in the envisioned centers are also included, and such possibilities include the magazine archives and playback machines.

The system will be designed so that no additional effort beyond current levels would be required on the part of network libraries to forward patron information changes to NLS. Libraries would be able to notify both CMLS and the centers of such changes in a single step.

The costs for the options estimated in Section 5 of the report should be contrasted with the estimated total costs for current network braille operations derived in the previous study, which is approximately $3,154,000 per year incurred by network agencies, and $173,000 per year incurred by NLS for MSC provided braille services. While Options B and C necessitate both the provision of reader advisory services from regional libraries and the modification of local ADP systems for the successful implementation of centralization, together with the associated costs for the provision of the RA services and the ADP modifications, Option A requires neither. The costs calculated for Option A assume 100% of reader advisory services are centrally provided. The significant net cost savings via centralization for Option A occur for essentially three reasons; (1) much lower facility space unit costs than the status quo, (2) economies of scale in the distribution and storage functions, and (3) streamlined distribution and storage operations employing comprehensive ADP support, optimal facility layout, and modern operating techniques.

SECTION 1

INTRODUCTION

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Section 1
INTRODUCTION

This section of the report presents an introduction to the efforts undertaken in Study I, Part 1 of the implementation project. The background, objectives and scope of Study I, Part 1 are initially discussed, followed by the study methodology that was applied, and finally the fundamental options that were selected by the National Library Service and the study Advisory Committee to be developed and presented in this report.

1.1 BACKGROUND

The National Library Service for the Blind and Physically Handicapped (NLS), Library of Congress, administers a free national library program for persons who are unable to read standard printed materials due to physical and/or visual impairments. In cooperation with authors and publishers of books and magazines, NLS is granted permission to mass produce copyrighted works. NLS works with a network of state, local and private libraries and agencies, which provides the necessary resources for the storage and distribution of the NLS materials. Books and magazines in braille, recorded disc, and recorded cassette format, as well as specially designed playback machines and accessories, are delivered to eligible patrons by postage-free mail, and returned to network libraries and agencies in the same manner.

The free national library program consists of three major components, each with its associated responsibilities, costs and revenue sources. NLS, funded by Congress, secures copyright permission from authors and publishers; contracts with firms for the mass production of braille and recorded books and magazines, machines, accessories, and repair parts; and administers the program. The United States Postal Service (USPS), funded by Congress for this program, provides transport of program materials between and among network facilities, patrons, NLS, and points of book and machine manufacture and repair. The network, consisting of state, local and private libraries and agencies, funded by various combinations of federal, state, local and private sources, provides the personnel, facilities and other resources necessary to provide NLS materials to patrons. The combined expenditure for the program is approximately

$120,000,000 annually, with the three major components bearing approximately equal portions of the total costs.

There were four basic types of facilities in the network during federal fiscal year 1991. Fifty six (56) Regional Libraries (RL) provide a comprehensive range of services, including services in addition to distributing NLS sponsored materials. Eighty-nine Subregional Libraries (SRL) provide service to a specified part of a regional library's territory. Four separate Machine Lending Agencies (MLA) in conjunction with the RLs, control and distribute NLS machines and accessories to patrons in a specified service area. Two (2) Multistate Centers (MSC) are NLS agencies that distribute program materials and backup supplies to network libraries and agencies, as well as braille and recorded books from special collections directly to patrons.

In 1989 and 1990, NLS contracted with Technology Management Corporation (TMC), a subsidiary of ManTech International and currently a division of ManTech Technical Services Corporation (MTSC), to perform a two-phase study of network operations. In the first phase of the previous study, TMC gathered information from a selected sample of network agencies, and network statistics compiled by NLS, and calculated both annual costs and a 15-year cost projection for NLS sponsored activities provided to patrons by the network. TMC found that the approximate costs of network operations for federal fiscal year 1989 (FY89) were $3,154,000 for braille book services, $7,724,000 for playback machine services, and $30,181,000 for recorded book services, for a total of $41,059,000 for all three services combined. In addition to the costs incurred directly by network agencies, NLS directly incurred approximately $805,000 in costs for its three multistate center operations of which $173,000 was for braille book services, $92,000 was for machine services, $387,000 was for recorded book services, and $153,000 was for publication and back-up supply services.

In the second phase of the previous study, TMC developed two alternative centralized service models, one for the provision of braille book storage and distribution services, and the other for the provision of audio playback machine storage, distribution and repair. Both alternative models proposed that service be provided from two national centers, and each model

was compared to existing service patterns at the time, i.e., 39 braille libraries and 57 machine lending agencies.

As a result of these studies, NLS determined that it was probably both feasible and economical to centralize braille book services and decided that an implementation study to this effect be undertaken. This report presents the first phase of the implementation study effort.

1.2 STUDY OBJECTIVE

The objective of Study I, Part 1 of the implementation project was to develop in detail the resource requirements, operating procedures and projected costs of two or three options for centralized braille services. The options were to be developed in sufficient detail in order to determine implementation feasibility on both a service and cost basis.

The analysis was to address resource requirements of all types, including automation, facilities, equipment, personnel, and any other requirements. It was also to address the most appropriate operating procedures to be employed at the braille centers. The analysis was furthermore to address operational goals and patron/network concerns about centralization as enumerated in RFP92-1 (which led to the current study) and as posed by the study Advisory Committee. Additionally, the analysis was to take into account results (not necessarily conclusions) from the previous studies, as well as any applicable U.S. Government standards and requirements for automation and telecommunications and any applicable existing or planned NLS systems. Finally, the analysis was also to address any impacts on agencies other than the centers themselves, and specifically to offer recommendations on the most effective and efficient arrangement of the proposed centers vis-a-vis the existing MSCs.

This report presents the results of the analysis and the developed options for centralized braille services. At the request of NLS, the discussion of automation aspects of the study and those of all other aspects of the study have been combined into a single volume.

1.3 STUDY SCOPE

Listed below are basic tenets regarding the development of the options for centralized braille services during the course of Study I, Part 1.

1.3.1 Book Acquisition Costs

The acquisition costs of NLS provided braille books and associated supplies for braille operations are outside the scope of this study, and have not been included in the analysis. However, ManTech believes that centralization will generally result in either lower acquisition costs for braille books made possible by enhanced control and inventory management relative to the status quo and also through economies of consolidation of the collection, or that centralization will result in increased flexibility in the production of titles produced, or in the required number of copies of individual titles given two stockage points rather than the present 39 (e.g. for two titles of approximately the same physical size, but different anticipated demand, the production runs could be 30/90 rather than 60/60 at identical cost).

1.3.2 Transportation/Postage Costs

The costs of transporting NLS provided braille books ("free matter"), performed by the United States Postal Service, are outside the scope of the study and have not been included in the analysis. However, ManTech believes that centralization will generally result in higher transportation costs for braille books due to longer distance average transits between patrons and supply points, i.e., central distribution centers. However, an estimate of expected postal transit times under centralization is presented in the report in Section 2.10. Additionally, a mailing test has been proposed that would measure actual transit times between the location of the centers and various points in the network.

1.3.3 Funding

The method(s) by which centralized braille operations would be funded, if centralization is adopted, is outside the scope of this study and is not addressed in this report.

1.3.4 Network Agency Resources

The redeployment of resources at the network agency level that would potentially be "freed up" by the implementation of any given centralization option is outside the scope of the study and is not addressed in the report. Also, the redeployment of funds for resources at the network agency level that would potentially be "freed up" by the implementation of any given centralization option is outside the scope of the study and is not addressed in the report.

1.3.5 Local Production

The storage and distribution of braille books/magazines that are locally produced are not addressed in this study since they are not NLS property.

1.3.6 Internal Concerns

Local concerns of a strictly internal nature regarding the centralization of braille services are outside the scope of the study and are not addressed in this report.

1.3.7 Participation

The flexibility of network library participation in centralized braille services, if implemented, is outside the scope of the study and is not addressed in this report. The assumption of full participation was made in the analyses that determined required resources under centralization.

1.3.8 Scope of Report

In this first phase of the study, detailed recommendations have been developed for each of the options under consideration, and especially for the selected option in this final report. However, the level of detail developed for a specific option is less than that which will be developed for the selected option in the second phase (Part 2) of the study. Similarly, a transition plan is not presented in this report because that effort is a distinct task that is scheduled to occur later in the study for the selected option.

1.4 METHODOLOGY EMPLOYED

The methodology for the conduct of Study I, Part 1 consisted of essentially five steps. These steps are discussed below.

1.4.1 Attend Orientation Session

On April 27, 1992, a half-day orientation session was held at NLS in which all study team members participated. The study team was briefed by various NLS personnel on the structure and functioning of relevant aspects of NLS and network braille operations and services. This session was valuable to all study team members, and especially to those who neither participated in the previous study nor perform other ongoing systems support and development work for NLS.

1.4.2 Review Prior Study Reports

Prior to the performance of site visits, the previous study reports on braille operations were reviewed by team members. These reports were reviewed both from the standpoint of re-familiarizing ourselves with the efforts and results of the prior studies, and in identifying weaknesses or other areas that deserved additional scrutiny/revisiting as part of the current effort.

1.4.3 Conduct Site Visits

Network sites were selected by NLS for site visits by the ManTech study team in order to develop an understanding of how network agencies function. The four sites selected, and the dates of the site visits, are shown below.

Site	Date of Visit
Texas Regional Library	Week Ending 5/15/92
Utah Regional Library	Week Ending 5/22/92
Multistate Center West	Week Ending 5/22/92
New York, NY Regional Library	Week Ending 5/29/92

There were essentially four objectives to the site visits: 1) determine exactly what braille services are currently being offered to patrons of the free national library program; 2) determine what resources, of all types, are currently being employed to provide the subject services; 3) determine what operating procedures are currently being employed to provide the subject services, including problems that are encountered; and, 4) collect, if available, accurate and representative, detailed circulation and collection histories of the braille collections, and detailed patron activity histories.

1.4.4 Attend First Advisory Committee Meeting

On June 4 and 5, 1992, the first meeting was held with the study Advisory Committee in Washington, D.C. At this meeting, various network and user concerns about potential centralization of braille services were discussed, and three fundamental options were identified by NLS and the study Advisory Committee for development and costing in Study I, Part 1. Descriptions of these three options are provided in Subsection 1.5 of the report. The various concerns expressed in this meeting about centralization have been addressed with the exception of those that are outside the scope of this study, per NLS, and which have been enumerated in Subsection 1.3 of the report.

1.4.5 Perform Analysis of Options

The analysis of the three systems options for centralization of braille services was performed after the first meeting with the study Advisory Committee, and took into account the objectives, constraints, and concerns enumerated in the study RFP and by the study Advisory Committee; the workload that must be handled at the centers under the options considered; and the procedures that should be employed based both upon observation of operations at the sites visited, and upon an independent analysis of operational procedures. In short, a five-step process was performed to derive the required results.

Determine Workload for Each Option

For each of the three options considered, the workload for the braille centers was initially defined. Using FY91 NLS data, the readership to be served by each center, the book collections to be housed in each center, the braille circulation to be handled by each center, and several other measurements of workload were quantified.

The resulting product was a statistical model of the input, storage, and output requirements and the response time demands that would be placed on the central distribution centers. The demand profile covered a sufficient time span to fully reflect the number and variety of transactions that would be encountered under both normal and exception conditions.

Determine Best Methods for Work Performance

Based upon operating procedures observed at the visited sites, an independent analysis of work requirements, and the relevant goals and objectives enumerated in the study RFP and by the Advisory Committee, the best operating procedures for performance of the subject services were developed.

Optimum storage modes were developed by considering the dimensions of the items that have to be stored, the quantities, the types of information support available via various ADP

configurations and human factors considerations. Several types of stock location schemes were considered, as well as different types of storage racks. Other considerations included load stack heights, optimum utilization of air rights, shelving depth, module configuration, storage aisle width, cross aisle widths, overall storage configuration layout, lot integrity and item accessibility.

Similarly, optimum receiving and putaway modes, and order filling modes were developed based upon practices observed at the visited sites and upon independent analyses. Considerations in these areas included: combined or separate receiving/shipping areas; locations of receiving/shipping areas in the overall configurations; the most appropriate types of material handling equipment to be used for receiving, putaway and picking functions; computer systems interfaces for receiving and issuing; the use of wanding (OCR) or scanning (Bar Code); and division and specialization of labor in the receiving/putaway and retrieval/issue functions.

Determine Requirements

With the workload for the centers defined and the best methods for work performance developed, the next step undertaken by the study team was to determine the resource requirements for the braille centers.

Staffing requirements for the major functional areas within the centers were determined based upon workload requirements, best practices, and established goals and constraints. Preliminary staffing figures were progressively refined as recommendations for proposed facility layouts and modes of operations were developed and operating schedules were finalized. Once the potential staffing and work schedules were established, the required labor complement by requisite skills, literacy levels, physical capabilities and other pertinent attributes were determined. ManTech then rationalized the most appropriate organizational structure for the centralized operations, the number of management personnel needed, and the personnel qualifications.

Facility space requirements and layout configurations were then developed. Given the storage requirements for the various braille collections, and the preferred storage methods (storage

equipment and layout), the facility space requirements for storage areas were determined. Given the circulation requirements for braille, and the preferred practice for receipt/putaway, retrieval, and order picking, ManTech determined the receiving/shipping area(s) and floor operations staff support areas. Given the readership supported, the circulation of books, and ALA standards for certain activities, as well as the services to be provided by the centers under each option, the office staff (reader advisers, clerical, managerial and ADP personnel) size was determined and subsequently the required office size and configuration. The final product regarding facility requirements were space allocation charts and layout drawings for facilities under each option.

Storage, material handling, and office equipment requirements were determined based upon workload requirements and best operating practices, exclusive of ADP equipment which was developed separately in the automation alternatives analysis. Tables enumerating the types and quantities of all equipment requirements were then developed. Requirements for other resources, such as utilities, city services, materials, etc. were either based upon the requirements documented at the visited sites and extrapolated by the multiple of the centers' workloads to the sites' workloads, or upon standard industrial estimation of certain costs.

Develop Costs of Operations

Development of the costs for operations was the last step in specifying the three service options. Included in these costs were:

- Labor
- Facilities
- Equipment
- Materials/supplies
- Occupancy (utilities, maintenance, security)
- Telecommunications
- Initial Conversion

Two projections of costs for each option are presented in Section 5 of the report. The first projection addresses a five-year time frame and is essentially a "cash flow" analysis, which recognizes the entire cost of a capital asset in the year in which it is procured. The second projection addresses the average, annual operating costs of operations by amortizing the costs of capital assets over the estimated useful lives of the assets.

1.5 CENTRALIZATION OPTIONS INITIALLY EVALUATED

The following three options were initially evaluated in the study as a result of the June 4 and 5, 1992, meeting with the Advisory Committee:

- Option A:
  - Reader advisory services located at centers (and possibly at some network libraries)
  - Profile Select circulation capability located at centers
  - Direct patron contact with centers for all braille services

- Option B:
  - Reader advisory services located at network libraries
  - Profile Select circulation capability at network libraries, with a batch transmission of selected orders
  - Direct patron contact with network libraries for reader advisory services, and with centers to place specific orders (including a direct order feature)
  - Real-time data telecommunications access to center's ADP system

- Option C:
  - Reader advisory services located at network libraries
  - Profile Select circulation capability at network libraries, with a batch transmission of selected orders
  - Direct patron contact only with network libraries, none with centers

- Real-time data telecommunications access to center's ADP system

For each of the above options evaluated and developed, the following assumptions applied:

- Braille books and back issues of magazines would be stored in, and distributed from the centers.

- Some partial or complete collections could reside at some regional libraries... the extent of this deviation was not specified.

- Automated systems at the centers would track only the NLS collection stored there, and would not track local collections that are not NLS property.

- Initial registration with the free library service would occur at network libraries.

A draft report for Study I, Part 1 was then prepared which contained a discussion of the development and evaluation of each of the three options and included the recommended operating procedures to be employed, the resources required to effect implementation, and the estimated costs for each. This draft report was submitted to NLS September 8, 1992.

1.6 RECOMMENDED OPTION AND FINAL REPORT

On October 13 and 14, 1992, the second meeting with the study Advisory Committee was held in Washington, D.C. At this meeting, the Study I, Part 1 draft report was reviewed and discussed, and a consensus was reached between ManTech, NLS and the Advisory Committee on what should be the recommended centralized braille book distribution system.

This recommended system is Option A, as defined during the first meeting in June, 1992, and as explained in the preceding subsection, together with the following three major

enhancements/differences that were not included in Option A in the draft report, but were added as a result of the second Advisory Committee meeting:

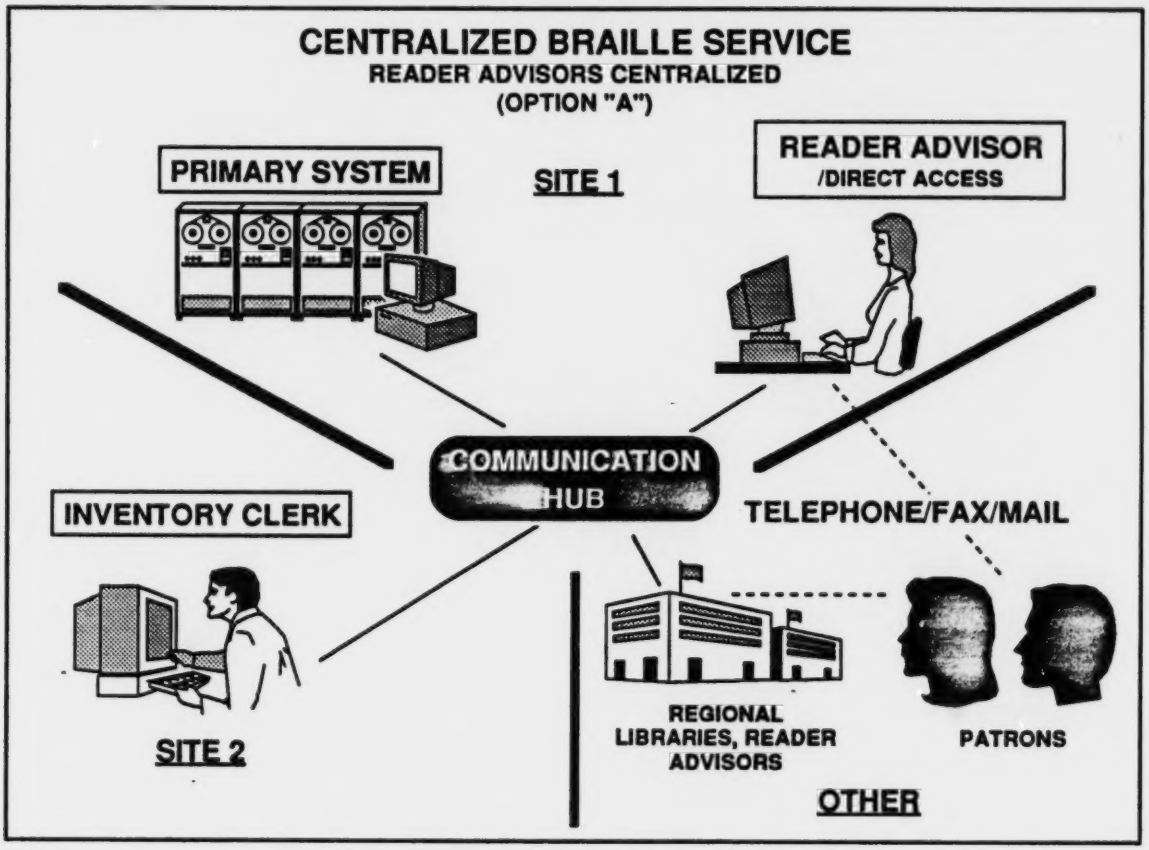
- A real-time data telecommunications access to the centers' ADP system, identical to that provided in Options B and C, would be provided to allow network libraries to continue to provide reader advisory services from the local level if they choose to make the minimum and/or desired modifications to their own ADP systems to facilitate this data telecommunications link,

- A direct patron access, Interactive Voice Response (IVR) capability should also be provided like that provided in Option B, and

- A capability to enroll patrons of non-participating libraries (those that do not turn over their collections to the centers) with the centralized braille service.

Appendix 1-1 describes the key features of the recommended service model as defined during the second Advisory Committee meeting, and Appendix 1-2 contains a listing of other points that served as guidance during the development of this final report for Study I, Part 1. Exhibits 1-A, 1-B, and 1-C present diagrammatic representations of Options A, B and C, respectively, at the highest level. For discussion purposes later in the report, Site 1 as noted in the exhibits is the Western Center, and Site 2 is the Eastern Center.

Exhibit 1-A



1200-3

Exhibit 1-B

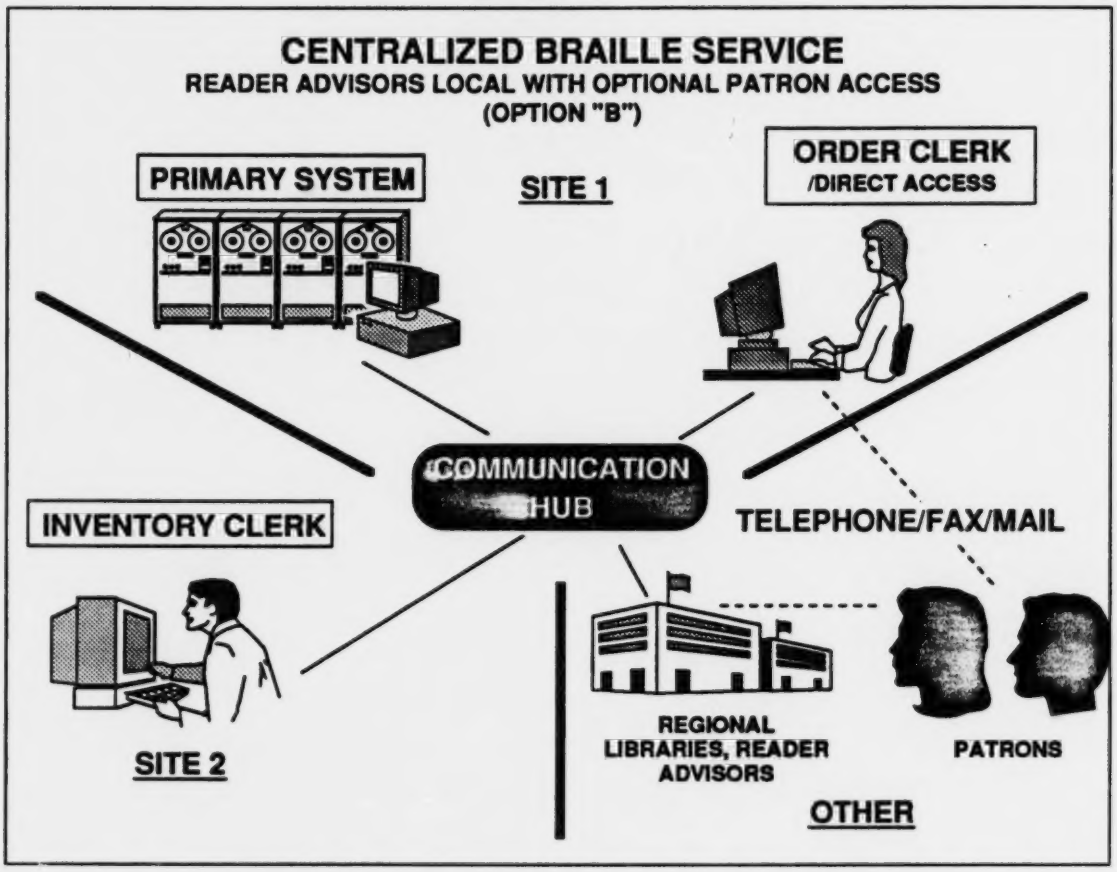
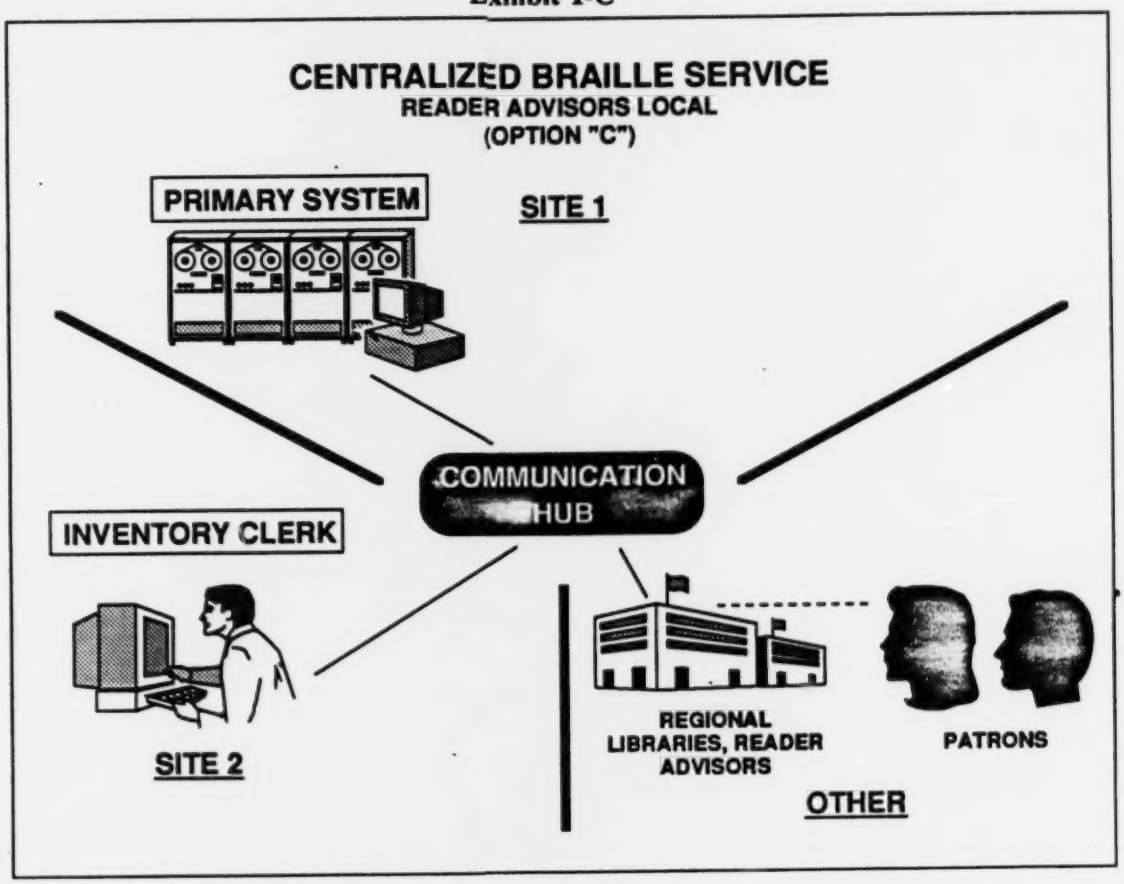

CENTRALIZED BRAILLE SERVICE
READER ADVISORS LOCAL WITH OPTIONAL PATRON ACCESS
(OPTION "B")
PRIMARY SYSTEM
SITE 1
ORDER CLERK
/DIRECT ACCESS
COMMUNICATION
HUB
INVENTORY CLERK
TELEPHONE/FAX/MAIL
SITE 2
REGIONAL
LIBRARIES, READER
ADVISORS
PATRONS
OTHER

Exhibit 1-C


CENTRALIZED BRAILLE SERVICE
READER ADVISORS LOCAL
(OPTION "C")
PRIMARY SYSTEM
SITE 1
COMMUNICATION HUB
INVENTORY CLERK
SITE 2
REGIONAL LIBRARIES, READER ADVISORS
PATRONS
OTHER

SECTION 2

DESIGN CRITERIA

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Section 2
DESIGN CRITERIA

This section of the report presents the development of the design criteria subsequently used to determine the appropriate resource requirements and operating procedures to be employed under each of the options evaluated. These design criteria included major assumptions about how centralized services would operate, workload to be handled by the centers, and service performance goals.

2.1 MAJOR ASSUMPTIONS

Below are listed major assumptions regarding how centralized braille services would function under any of the three options evaluated. These assumptions were considered to be axiomatic, and served as constraints in the direct determination of workload requirements and operating procedures, and thus indirectly in the determination of resource requirements and costs.

2.1.1 Number of Braille Centers

There will be two (2) braille distribution centers under any centralization option. Although a two-center configuration does not absolutely maximize the benefits of centralization (one center does), it was determined in the previous study that it is the most appropriate configuration for three reasons:

- diversification of risk to the national collections, i.e., storing the collections in two physical locations rather than one location,

- reduction of delivery time of materials to patrons relative to a one-center configuration, i.e., the average delivery times to patrons are decreased with an increasing number of geographically distributed centers, and

- the benefits of reduction in delivery time in employing three (3) or more centers is more than offset by a reduction in the economies of centralization such as enhanced inventory control, managerial efficiencies, and space utilization.

2.1.2 Location of Centers

The location of the two centers will be the metropolitan areas of Cincinnati, Ohio and Salt Lake City, Utah. These sites were selected as locations for the centers in the previous study for the reasons that are listed below.

- they are excellent sites with regard to minimizing the average delivery time of materials to patrons given a two-center scenario,

- they both have very favorable prevailing labor costs (below the national average),

- they both have very favorable prevailing facility space costs (below the national average), and

- they each have more favorable weather conditions than their closest "competitors" (relevant to the extent that center operations and postal pickups/deliveries would be affected by weather).

2.1.3 Regions of Service

There will be two distinct service regions in the country, an eastern region and a western region. The eastern region will consist of all U.S. states and territories east of the Mississippi River, and additionally the states of Missouri, Arkansas, and Louisiana, while the western region will consist of all other U.S. states and territories. This definition of regions was established primarily to minimize delivery time of materials to patrons, and secondarily to level the workload of the centers. The special case of provision of centralized service to patrons in the state of Hawaii is further discussed in Section 2.10.

Patrons in each service region will receive materials from their own regional center, with the following two exceptions: 1) special collections, that typically consist of one copy per title, will be housed in only one center and these materials will be available to all patrons of the program on an equal basis, and; 2) if a book or magazine is available in one regional center that is not the "home" center of a patron, and that patron has a standing order for that particular title, it will be sent to that patron if still available after order generation for the patrons living in the service region whose center has the material available.

2.1.4 No Weeding Prior to Centralization

Based upon both the concerns of the Advisory Committee, and direct instructions from NLS, it was assumed that there will be no weeding of the BR collections currently housed in network libraries prior to consolidation in the braille distribution centers (this is not an issue for all the other braille collections... there are too few copies per title to consider the possibility of weeding). Therefore, the design criterion used for the storage of the BR collection in the centers was that all existing copies of all titles will be initially retained.

However, it should be noted that ManTech, NLS and the Advisory Committee all concur that some, possibly extensive, weeding of the collections will be possible after consolidation because of the pooling of demand at two stockage points rather than 39 points (35-RLs, 2-MSCs, 2-SRLs). For example, over the years as the Utah RL has absorbed the braille workload of multiple states, the Utah RL does not necessarily absorb all the copies of all the books in these collections; rather, they determine on a title-by-title basis whether or not it is necessary to increase the number of copies they retain. However, it has been determined from an analysis of Utah and Texas RL circulation histories, by title, that weeding should not necessarily be solely "age based," i.e., reducing the number of copies retained simply because a book is "old"... popularity of the title must also be considered. Therefore, it is recommended by ManTech, and NLS is in concurrence in this regard, that weeding occur on a title-by-title basis after a circulation history has been developed at the centers.

A theoretical argument for weeding of the BR collection is shown in Appendix 2-1, on a macro level. This calculation relies upon the "Square Root Law," which is an approximation of the relationship between safety stock levels and the number of consolidated facilities, and measures the changes in safety stock levels required when inventory is consolidated. In brief, safety stock is retained to cushion against a variance in demand, otherwise it would be unnecessary, and the standard deviation of demand at a centralized facility is equal to the uniform decentralized standard deviation of demand multiplied by the square root of the number of consolidated facilities. As Appendix 2-1 shows, the number of copies per title retained in two central facilities under an identical demand environment to the present is 25.4, versus an average of 60 which is the current national stockage level. Therefore, as noted in the previous study, opportunities exist for significant weeding with no reduction whatsoever in the availability of books to patrons, or for moderate weeding with a significant increase in book availability to patrons relative to the current configuration.

2.1.5 Free Standing Facilities

It was assumed that the braille distribution centers will be free standing facilities. That is, based upon the workload requirements, service performance times, and other operational constraints and objectives, the resource requirements, operating procedures, facility layouts, etc., were developed for independent operations.

The impact upon the existing Multistate Centers was assessed and is presented in this report, as are recommendations regarding any consolidation of braille centers and MSC operations. However, the fundamental design of the operation was in no way constrained by the existing MSC operations and facilities, but developed from a "zero-base" perspective.

2.1.6 Modern Techniques/Technology

The design of the braille distribution centers took into account modern technology and techniques, both in the distribution arena and in all other areas. This was the desire of the Advisory Committee and of NLS. Furthermore, the ALA Revised Standards and Guidelines of

Service for the Library of Congress Network of Libraries for the Blind and Physically Handicapped 1984 cites:

- (p. 14) "LC/NLS shall initiate and carry out research to determine the most advanced methods for efficient management of the network and for delivery of library services to users."

- (p. 20) "Network libraries shall use equipment and materials reflecting technological advances to improve library operations and services."

- (p. 20) "Network libraries shall make available technologically advanced equipment, services, and materials to improve users' access to information and library services."

Although the envisioned centers are not, in fact, regional libraries, the above statements can be considered generally relevant to the operation of the centers.

2.1.7 Not Regional Libraries

The envisioned braille central distribution centers are not libraries, per se, but rather mail order distribution facilities. This definition does not, however, preclude a full range of reader advisory services, including initial registration of patrons from non-participating states, which are to be provided under Option A.

The ALA Revised Standards and Guidelines of Services for the Library of Congress Network of Libraries for the Blind and Physically Handicapped 1984 contains the following statement on page 8: "The actual services Multistate Centers provide are not specifically addressed in these standards because MSC services are governed by contract with LC/NLS and are considered LC/NLS services." The envisioned centers are neither MSC's nor RL's, but something else altogether. However, in those areas where the ALA standards/guidelines appeared

to have some relevance, they were considered in the development of resource requirements and operating procedures.

2.1.8 Scope of Centralized Services

In developing the design of the centers, it was assumed that only NLS-owned braille books and magazines would be stored and distributed, and that any other services, e.g., reader advisory services under Option A, would relate only to braille services. However, after reviewing this report, ManTech believes that both NLS and the Advisory Committee will see the potential synergies of possibly consolidating other items in the centers that could be supported by sharing the same resources that are to be deployed in the braille centers. For example, if it is determined in Study II that machine centralization appears feasible, economical and implementable, ManTech anticipates that NLS will be interested in determining the resource requirements and costs for a consolidated braille/machine facility, which is a task outside the current contract, but nevertheless a logical extrapolation of Study I and Study II.

2.1.9 Cost Basis

The base year used for estimation of prices of resources to be deployed in the centers was 1992. Since it is currently unknown whether or not braille centralization will actually be implemented, nor if it is implemented when and how it will be phased-in (to be determined in the study transition plan), 1992 costs were used.

Given the current state of the national and global economy, and various economic forecasts that indicate very slow growth for the next few years, inflation will, in all likelihood, be very low for the next few years. Additionally, cost trends over time for ADP hardware of given capability are virtually always declining due to intense competition and improved manufacturing techniques. Therefore, little error is introduced by using 1992 as the base period for costing-out resources.

2.1.10 Verification of NLS Compiled Data

FY91 readership, circulation and collection statistics were furnished to ManTech by NLS shortly after the completion of the site visits in early June, 1992. Because the statement of work for the study neither required the verification of the subject statistics, nor did ManTech propose verification of the subject statistics, most of the data was accepted verbatim. However, there were two exceptions to this rule:

- Extreme outliers were reconciled by contacting the facility that reported the data, and

- It is well known to ManTech, NLS and the network that some network libraries report *copies* of braille circulated and in the collection, while other libraries report *volumes*. In subsequent analyses, a unit of measure was assigned (known or estimated) as to whether copies or volumes were reported, and this unit of measure assumption is clearly stated, for each site, in this report.

2.1.11 Book Circulation Convention

It was assumed that whole braille book circulation would be the rule, and individual volume(s) circulation the exception, at the centers, even though the fundamental material handling/storage unit is a volume not a copy. For example, if a 3-volume book is on order and only two of the three volumes are available, the system would not generate an order for the two available volumes. However, there should be an exception option available whereby a single volume, or several volumes, of a book could be shipped to a patron. For example, a patron may require only two volumes of Roget's Thesaurus, not all the many volumes that constitute this book. Whether or not reference books like Roget's should be stored in the centers is posed in Subsection 2.11.4.

2.1.12 Walk-In/Browsing/Tours

The centers, being modern, mail-order distribution facilities, were not designed with the intent of patrons browsing in the facility. The physical storage layout itself, and the sequence of book storage, is not conducive to browsing. It was therefore determined by the Advisory Committee that there should be no browsing areas within the centers and that patrons would be better served by establishing modestly sized deposit collections in participating libraries. However, the materials retained in such deposit collections should not be books in high demand as they would be best utilized in the centers. The NLS and Advisory Committee do believe it to be desirable to provide both a walk-in service to patrons, as well as tours of the facility (except in Option C).

2.1.13 Integrated Distribution Facilities

The envisioned centers are to be integrated distribution facilities, not warehouses. The term integrated distribution facility implies a very strong customer service oriented operation with rapid response times, as opposed to the term warehouse, which implies neither a customer orientation nor rapid response times.

2.1.14 No Pre-Established Cost/Profit Objectives

In determining the resource requirements for the implementation of effective and efficient centralized braille services, there was no pre-established cost or profit objective that was sought. The concept of overall operational profit, in terms of internal rates of return, payback periods, etc. is not applicable in the evaluation of not-for-profit operations. While it would be desirable to have the hypothetical centers operate more efficiently than the status quo, there was no applicable "cost target" that, above which, an option would be deemed too expensive. However, resources have been quantified, and capital investments recommended, that "make sense," i.e., they would enhance effectiveness and/or efficiency and are "reasonable."

2.2 READERSHIP SERVED

Appendix 2-2 presents the braille readership of the free national library program as reported to NLS by the network libraries and MSCs for FY91. Several assumptions were made in the compilation of the readership statistics, which were:

- each deposit collection/institution was assumed to have four (4) individual braille readers, which is the standard NLS approximation; since the compilation of the report, this approximation has changed to six (6) individuals per institution, however, this changed assumption does not impact the pro forma readership (number of individuals and institutions) and circulation estimates for centralized service,

- the city shown in Appendix 2-2 houses the RL (or MLA, where there is no RL) for that state/part of state whether or not the braille service itself originated from that location,

- overseas readers will be served by both centers,

- the statistics exclude braille music readership, since braille music would neither be distributed from, nor stored in, the centers (per NLS),

- readership in Hawaii is included in the pro forma workload for the centers, although it is still to be determined whether or not centralized service would be provided (ref. Section 2.10).

Shown in Appendix 2-2 are: the service region for each state/territory in the network (ref. Section 2.1, Regions of Service), the individual, institutional and total estimated patrons to be served by state/territory; the total, minimum, maximum, average and standard deviation of readership for the entire network, by individual, institution and total patronage, and; the pro forma readership and percentage of total readership for each center for individuals, institutions

and in total. In all, there are estimated to be 20,264 total patrons, with 6,549 (32.3%) to be served by the western center and 13,715 (67.7%) to be served by the eastern center. It should be noted, however, that all patrons will be served by the western center (logic explained in Section 2.4) with regard to storage and distribution of materials from several special collections.

Appendix 2-3 contains an analysis of out-of-state Utah RL braille patrons' circulation activity (this data was not available for in-state patrons) for FY91. This calculation was performed simply to examine the readership-circulation profile in order to gauge relative activity. Two points are noteworthy here:

- 30% of the supposedly "active" braille patrons are, in fact, inactive, and,

- a Pareto's Law effect (the "80%/20% rule") is quite evident in this example, specifically, the top 27% of patronage is reading 82% of the books.

One additional point is noteworthy regarding the readership to be served by the centers. Based upon inputs from the Utah, Texas, New York and Massachusetts regional libraries, it is estimated that approximately two-thirds of the braille patrons will elect to be placed on Profile Select circulation status.

2.3 CIRCULATION GENERATED

Appendix 2-4 presents the braille circulation (of the BR collection) of the free national library program as reported to NLS by the network libraries for FY91. Several assumptions were made in the compilation of the circulation statistics, which were:

- the city shown in Appendix 2-4 houses the RL (or MLA, where there is no RL) for that state/part of state whether or not the braille service itself originated from that location,

- overseas readers would be served by both centers,

- the statistics exclude braille music circulation, since braille music would neither be distributed from, nor stored in, the centers (per NLS),

- a "probable reporting unit" has been assigned for each location, which is based upon either first-hand knowledge, data compiled in the previous study, or estimated based upon other considerations.

- circulation to Hawaii is included in the pro forma workload for the centers, although it is still to be determined whether or not centralized service would be provided (ref. Section 2.10).

Shown in Appendix 2-4 are: the service region for each state/territory in the network; the individual, institutional, interlibrary loan and total circulation by state/territory; and, the pro forma circulation and percentage of total circulation of each center based upon both the actual statistics reported (ostensibly volumes) and upon the statistics as adjusted for reporting units (adjusted to copies). ManTech believes that the total circulation that is reported in original units of measure is meaningless (because "apples and oranges" are being added together) and because it implies that the average patron reads less than 6 (5.95) books per year. The adjusted total circulation implies the average patron reads almost 10 books per year, which seems much more representative of patron activity based upon data collected at visited sites in this study and the previous study.

Notice that the percentage of pro forma circulation by region is very robust with respect to reported statistics (34.8% West/65.2% East) and adjusted statistics (35.5% West/64.5% East). Also note that both sets of circulation totals by region are in almost exact alignment with readership (32.3% West/67.7% East).

Appendix 2-5 presents the circulation of all braille books and magazines circulated to patrons of the free library program by the MSCW and the MSCE in FY91. All of these reported statistics are shown in copies (books/magazines), not volumes. This appendix shows: the site (state/territory) to which materials were circulated; the number of books/magazines circulated by

site, by braille collection, and the MSC that circulated the materials; and, the total quantity of books/magazines circulated from each collection and MSC. A total of 8,063 braille books (copies) and magazines were circulated from MSCs in FY91, of which the MSCW circulated 4,668 and the MSCE circulated 3,395.

Appendix 2-6 presents the pro forma circulation for the braille centers based upon current network circulation (the logic for collection allocation between centers is explained in Subsection 2.4). This exhibit shows the various braille collections that will be handled by the centers, the total annual and daily copy and volume circulation by collection, the average number of volumes per copy by collection, and the total annual and daily copy and volume circulation for each of the two centers by collection. Several assumptions were made to derive this pro forma circulation profile:

- total annual national circulation is based upon an average patron activity of 10 books/magazines per individual patron per year,

- the BRA Master collection will be housed in the centers, but not circulated to patrons - the circulation required to send the books to manufacturers for reproduction is so variable, and so relatively small, that it was not estimated,

- the BRX collection circulation is estimated - the collection is new and has no history, and

- there are 250 working days per year (weekdays less 10 holidays) at the centers.

Based upon input from both the Utah and Texas RLs, it is estimated that 55% of center circulation will be generated from Profile Select, 40% will be generated from patrons directly contacting reader advisors via telephone (wherever the reader advisors are located), and 5% will be generated by Braille Book Review forms received via the mails. The 55% figure for Profile Select circulation (Utah) was assumed rather than 60% (Texas) to incorporate a conservative estimate into the calculation of telephone traffic estimates. The information received from the

New York City RL was unrepresentative because the operation underwent a facility transition during the time period for which data was available, and circulation was only approximately one-half of "normal."

2.4 COLLECTIONS HOUSED

Appendix 2-7 presents the braille collections (BR) of the free national library program as reported to NLS by the network libraries for FY91. As was the case for circulation, wherein some sites report volumes and some sites report copies, a "probable reporting unit" has been assigned for each collection at each reporting location. This probable reporting unit is based upon either first-hand knowledge, data compiled in the previous study, or estimated based upon other considerations.

Shown in Appendix 2-7 are: the service region wherein each of these braille collections resides; the reported number of collection "volumes" (some are copies, some are volumes) by site; the reported number of collection titles, by site; the probable reporting unit; the adjusted/estimated collection size in volumes, and; the total and regional numbers and percentages of the reported and adjusted collection size in volumes.

Notice that the percentage of total collections currently housed at individual sites within each of the defined hypothetical regions is very robust with respect to reported statistics (31.2% West/68.8% East) and adjusted statistics (35.7% West/64.3% East). Also, note that both sets of collection totals by region are in almost exact alignment with readership (32.3% West/67.7% East) and adjusted circulation (35.5% West/64.5% East).

Appendix 2-8 presents the BR collection profile based upon input from the Utah and Texas RLs. The collection profile is stratified both in title ranges of 1,000 books, and in title ranges of 333 books (roughly equal to one-year's production), showing the number of titles in each range, the sum of volumes in each range, and the average number of volumes per title in each range, and in aggregate. On average, a BR title consists of 2.23 volumes per copy, which

is significantly different from the 3.0 volumes per title approximation that is commonly used and that was used in estimating collection size in the previous study.

Between Utah and Texas, a total of 8,514 unique BR titles were identified. Based upon this information, and data obtained in the previous study from the NLS BRS system, 8,547 BR titles have been identified. Of course, the number grows by more than one title every working day ((325 titles/year)/(250 days/year) = 1.3 new titles per working day are added to the collection).

Appendices 2-9 and 2-10 present analyses of the Utah (8 months) and Texas (10 months) regional libraries' BR collection and BR circulation activity. This data was compiled in order to determine circulation activity by age of title (i.e. title range) and to determine the average number of copies per title retained in each of the title ranges. A number of findings were derived from these analyses:

- although the Texas RL circulation declined monotonically with age of title in a relatively uniform manner, this was not the case for Utah, i.e., there was greater circulation in some of the older title ranges than in some of the more recent title ranges,

- both libraries retain fewer copies of older books than newer books, although this scheme is much more pronounced for Texas than it is for Utah, and

- on average, Utah had four (4) books (copies) outstanding per patron, while Texas had considerably fewer outstanding per patron.

Appendix 2-11 presents the profile of all current NLS braille collections with the exception of the magazine archives, the BR archives and braille music, none of which would be handled by the centers (per NLS direction). This appendix shows, for each collection, the current location of the collection, the number of titles, the average number of copies per title, the total number of copies, the total number of volumes, the average number of volumes per copy, and

the average number of volumes per linear foot of shelf space. This profile represents the total collection size that is to be managed in both centers, and includes the current Hawaii RL BR collection, which may or may not be centrally stored and distributed (ref. Section 2.10).

Appendix 2-12 presents the recommended pro forma allocation of the various collections between the two centers. The three criteria applied in deriving this allocation scheme, in order of priority, were risk diversification, balance with expected circulation and readership, and leveling of workload between centers. Shown in Appendix 2-12 are the titles, copies and volumes of each braille collection to be managed by each of the centers. The following collection allocations are recommended:

- BR - Position 34% of the collection in the western center, and 66% of the collection in the eastern center to be in balance with readership and circulation,

- BRA - Position one set in the western center and two sets in the eastern center to be in balance with readership and circulation,

- BRF - Position two of three copies in the eastern center and one of the three copies in the western center to be in balance with readership and circulation,

- BRA Masters - House in the western center, for load leveling (these do not circulate) and risk diversification,

- BRA Pre-13,000 - House in the western center, for load leveling and risk diversification,

- BRJ - House in the western center, for load leveling and risk diversification,

- BRX - House in the western center, for load leveling and risk diversification,

- Magazines - Position two copies of each title in the western center, and two copies in the eastern center for service balance and risk diversification.

Although Appendix 2-12 shows the allocation of collections to be physically managed by each center, the centers will not have to store all of these entire collections at any one time because some portions of the collections will be "in float," i.e., either in the hands of patrons or in the mails. Appendix 2-13 shows the estimated number of copies and volumes, for each collection, for each center, that are expected to be in float or "in-house" (i.e. stored) at the centers at any instant in time. The average float was estimated as four (4) BR copies per patron, and the other collections' floats were estimated from MSC reported circulation assuming a 6-month loan period; the BRX float was entirely estimated, because there was no history to base it upon. Also shown in Appendix 2-13 are the minimal required linear feet of shelf space (1-foot deep) required to store the collections expected to be in storage at any given time assuming that a random storage concept is implemented; this figure is approximately 20% higher if fixed slot storage is employed.

2.5 SERVICE PERFORMANCE GOALS

There are a number of service performance goals that have been established that served as system design objectives in the determination of resource requirements and operating procedures for the two centers. These goals are enumerated below.

2.5.1 One-Day Response

The centers are to respond within one working day in the fulfillment of all service requests placed upon them. "One working day" is interpreted as a continuous 24-hour period, with the exception of weekends and holidays. However, the centers' operational design considerably betters this objective.

2.5.2 Reader Advisor Services

There is a stated goal that the centers shall provide reader advisor services (if applicable for a given option) that are commensurate with the highest level achieved in the network. Unfortunately, this level is an unknown quantity, since every site in the network would have to be directly surveyed in order to make this determination. Reader advisor staffing for the centers (for Option A) was based upon modified ALA requirements, the requirements for responding to patron telephone requests, and an examination of labor utilization in the current and previous studies.

2.5.3 Voice Communications for Patrons

The operation designed is to provide patrons of the service toll-free telephone (800) access for the placement of service requests. The waiting time for free lines should be minimal, and reader advisors (Option A)/clerk-operators (Option B) should be available during normal working hours in all time zones serviced in the continental U.S. Normal working hours are interpreted as 9:00AM - 5:00PM, however, the operational design calls for an 8:00AM - 5:00PM service coverage (because a number of regional libraries are currently offering such coverage). Additionally, patrons should also be permitted to leave messages on an answering machine outside of the center's normal office hours. A careful analysis of anticipated telephone traffic was used to derive the resources required to satisfy the minimal waiting time requirement. The cost of 800 service has also been carefully determined.

2.5.4 Two-Way Transfer of Data

For Options A, B and C, there must be a mechanism for 2-way transfer of data between the centers and regional libraries. This has been provided for in the automated systems' designs.

2.5.5 ALA Standards

There is a stated goal that "centers shall maintain staff in accordance with ALA Revised Standards and Guidelines for functions covered by said standards." However, these established standards/guidelines generally do not apply for several reasons:

- the centers are not designed to be network libraries (reference Subsection 2.1.8), and would not be considered libraries by the ALA,

- the centers would not be providing the full range of services that a network library provides to patrons. Specifically, neither recorded book services, nor playback machine services, nor initial registration with the free library program (except for patrons from non-participating states who desire the service) would be performed at the centers. The ALA standards, however, implicitly assume that all three of these functions are being performed. The direct application of these standards would result in significant overestimation of labor resources,

- some of the standards are somewhat outdated (1984) due to technological improvements since they were derived. In the case of the centers, various capital investments are recommended that result in significant labor savings in the distribution functions relative to that estimated as being required in 1984.

2.5.6 Reporting Requirements

The centers must be able to provide periodic reports on readership, circulation activity (especially useful for collection development and production planning), and consumer feedback to NLS and network libraries, and provide collection information to NLS. Also, some additional information, such as telephone traffic, may be reported to NLS.

2.6 VOICE COMMUNICATIONS

A detailed analysis was performed to determine the expected 800 telephone traffic into the centers, which is relevant to Options A and B. This analysis was based upon a three-month record of Utah RL out-of-state braille patrons' telephone traffic. This data was, by far, the best source of data to use for this determination for a number of reasons:

- it had "no competition," i.e., none of the other two RL sites could furnish any telephone traffic data that was braille specific,
- when the Wyoming calls were factored out (these patrons also receive recorded book services from Utah), the data pertained exclusively to braille related calls,
- it was a good sized sample, i.e., almost 700 patrons, and detailing three months of calls,
- the data was itemized by call, showing the date and time of the call, the connect time, and the originating state and phone number,
- the sample is representative of the pro forma average national reader profile, i.e., approximately two-thirds of the patrons are using profile select, profile select generates 55% of the circulation, and the patrons average slightly above the 10 books/reader/year national average that has been estimated.

Appendix 2-14 shows the calculation of the expected telephone traffic load at the centers based both upon an analysis of the Utah data, and an independent analysis of traffic based upon the assumptions that 40% of all orders are placed by phone and that, on average, one book/magazine is ordered per call (of course more than one book could be ordered in one call; alternatively, a call could pertain to an address change with no order placed). Both approaches yielded surprising close results, 317 and 324 calls per day, respectively. A value of 325 calls

per day was selected as a design criterion, as was an average duration of 3.0 minutes per call (Utah actual was 2.99 minutes per call).

A further analysis of the Utah data yielded three results that considerably simplified the analysis of the telephone traffic at the centers and the calculation of required staffing to respond to calls with minimal waiting time. These three results are:

- The calls arrive in a fashion that is completely typical of incoming service arrivals in a telephone network, and can be closely modeled by the Poisson statistical distribution. That is, calls arrive randomly, in any given time period (day or hour), according to the distribution. Appendix 2-15 shows a comparison of the Utah data with a Poisson distribution for arrivals per day, and Appendix 2-16 shows a comparison of arrivals per hour, with the hour from 2:00PM to 3:00PM selected.

- The service times, i.e., call durations and variations, are completely typical of service times in a telephone network, and can be closely approximated by the Exponential statistical distribution. That is, service times are exponentially distributed in a declining fashion. Appendix 2-17 shows the comparison of the Utah data with an Exponential distribution for service times.

- The hourly variation in telephone call arrivals is completely typical of a Bimodal telephone traffic pattern, wherein hourly fluctuations occur because of changes in usage as the business day peaks before and after, and wanes during, the lunch hour. There are pronounced late morning and early afternoon peaks, and a pronounced "dip" around the noon hour. Appendix 2-18 clearly shows this Bimodal pattern for the Utah data. The peak hour is 2:00PM - 3:00PM, and represents approximately 13.5% of daily demand.

Appendix 2-19 shows the results of a queuing analysis for pro forma toll-free voice communication traffic into the centers, and for staffing requirements for phone reception, for

Option A assuming all patrons would utilize reader advisory services at the centers and without the addition of the IVR (conservative assumptions). These calculations were derived through the use of queuing equations that are applicable for situations wherein the arrivals are described by a Poisson distribution and service times are described by an Exponential distribution. The peak hour of 2:00PM - 3:00PM was focused upon as the design criterion for the number of required reader advisors (Option A) necessary to realize a minimal waiting time for patrons.

The situations for 3, 4, 5 and 6 reader advisors are shown in Appendix 2-19, which include: the average queue length (i.e. number of calls on hold); the probability that a patron will have to wait for service (i.e. encounter a message saying "please hold for the next available reader advisor"); the mean waiting time in the queue; the utilization of the servers (i.e., the time RAs actually spend on the phones) during the peak hour; and, the utilization of the servers during the course of the entire day. Based upon this analysis, it is recommended strictly from the standpoint of the need to provide telephone reception service, that a single central office under Option A be staffed with five (5) reader advisors. This would facilitate a service environment wherein there would only be a probability of 8.3% that a patron would have to wait for service, and if the patron had to wait, the average wait would be 5.3 seconds. For Option B, it is recommended that two clerks man the phones for reception purposes (here it was assumed that two-thirds of all calls would be placed upon reader advisors located in network libraries, and one-third on the centers).

2.7 TELEFAX COMMUNICATIONS

There is an anticipated need for telefax communications between and among the centers, network libraries, NLS, braille manufacturers and possibly patrons in all of the operational options. The volume of traffic that would be in telefax form, however, is not easily determined. It is projected that one machine per center will be required and will be adequate to support operations under any of the options.

2.8 MAIL

It is estimated that approximately 5% of total orders placed upon the centers under Option A will be in the format of Braille Book Review forms. Under Option B, the mail orders would be split between the centers and the network libraries, and under Option C no mail orders would arrive at the centers (no direct patron contact), with all orders placed by network libraries arriving electronically via data telecommunications. Under each of the options, there will also be mail correspondence among the centers, NLS and network libraries.

2.9 BAR CODING FOR USPS AND INTERNAL USE

Based upon discussions with a representative of the Container and Material Handling Division, Engineering and Development Center of the United States Postal Service, it was learned that the USPS will, in the near future, be employing the use of conveyorized and manual bar code scanning systems for the processing of parcels in the bulk mail network. It was *strongly* recommended by the USPS that, in the design of the distribution systems at the centers, that the zip codes of both the address of the patron and the address of the centers on the pick ticket/ mailing label be bar coded according to recently established specifications. These specifications are included as Appendix 2-20.

It is strongly recommended by ManTech that the envisioned centers employ bar coding of both patrons' and centers' zip codes for the following reasons:

- it will expedite delivery to patrons and returns to the centers; if bar coding of zip codes is not implemented, braille may pass into the "slow stream" (i.e., non-bar coded parcels) in the bulk mail centers,

- given the relationship the USPS has to the free national library program, i.e., it shoulders approximately one-third of the program's total costs, if USPS promulgates such a reasonable suggestion to NLS, it may be prudent to implement it, and,

- it would possibly eliminate any necessity for manual pre-sorting of parcels at the centers, which would result in labor savings.

The specification for the bar coding of zip codes allows for three different formats (USS-I2/5, AIM; USS-39, AIM; or USS-128, AIM), and will rely on reading 6, 10 or 16 characters. The 6-digit code is the 5-digit zip code plus a check character, the 10 digit code is the 9-digit zip code plus a check character, and the 16 digit code includes a 9 digit zip code, 6 other digits of information to facilitate automatic tracking and billing for bulk mailers, and a control character.

The design of the centers' operations also incorporates the use of bar coding for inventory control and tracking, and will facilitate distribution functions overall. Given both the USPS requirement for zip code bar coding, and certain advantages bar coding has over OCR, bar coding was selected as the method to be used to facilitate and streamline operations at the centers. Because the centers will also use a bar code on the pick tickets representing a unique transaction code, the USPS recommends that "ZIP" or "ZIP CODE" be printed out next to the bar code that represents the zip code so that USPS manual scanners will scan the correct code. It was further recommended by the USPS to *not* use 6, 10 or 16 character bar codes as the transaction bar code on the pick tickets.

2.10 USPS DELIVERY TIMES

The delivery times of braille books in the USPS bulk mail stream will be outside the control of NLS and the envisioned centers, with the following three exceptions:

- the bar coding of patron and center zip codes will expedite delivery from and returns to the centers,

- pre-sorting, with or without the bar coded zip code, could expedite delivery time to patrons (USPS said to contact them on this matter if the decision to implement centralization is made), and,

- the new, envisioned braille containers may expedite service because it will not contain the buckled straps and the metal corner reinforcers that the existing containers have, both features of which have caused problems for USPS in processing and which has, evidently, led several BMCs in the past to separately process these parcels in a separate, slower, manual routine off of the conveyors.

Other than the above, the delivery time to and from the centers is outside NLS, distribution center or network control.

In the previous study, delivery time estimates from the centers to patrons were estimated based upon over-the-road mileage between the centers and demand points, and postal service standards for bulk business mail. Based upon recent discussions with the USPS, it was advised that delivery times be estimated based upon bulk parcel post (the class of mail that braille containers are considered to be) flow through the mail network, and the delivery time is a direct function of how many bulk mail zones the materials must travel through. Appendix 2-21 shows the bulk mail zones in the continental U.S.

Appendix 2-22 presents an estimate of average postal delivery times based upon parcel post bulk mail service priority and the delivery standards for parcel post, which is essentially two days within a bulk mail zone, and one additional day for each bulk mail zone a parcel must pass through. Furthermore, the calculation takes into account the fact that, on average, 70% of parcels meet the standard, the next 10% are delivered one day longer than standard, and so forth in a rapidly declining fashion.

Appendix 2-23 presents an estimate of postal delivery times for parcels mailed from each of the hypothetical centers to various locations in the network, which are based upon the values derived in Appendix 2-22. The destination locations selected are the current locations of regional libraries (or MLAs, if no regional library exists). This appendix shows both the number of bulk mail zones through which a parcel must transit from each center to each of the destinations, and the estimated number of days required for delivery.

Because there is some concern that the only conclusive way to determine actual delivery times from the centers to various demand points is through a test, NLS asked ManTech to propose a test whereby a given number of braille containers would be mailed from both existing MSCs to various locations of the country. The proposed test is included in this report as Appendix 2-24. ManTech recommends that the test be conducted, but it is incumbent upon NLS to actually conduct the test and collect the resulting data.

Appendix 2-25 contains an analysis of alternatives to free matter delivery, i.e. parcel post, of braille from the centers to patrons in the state of Hawaii. Because the delivery time for parcels mailed from Salt Lake City to Hawaii is approximately six (6) weeks (the parcels travel by ship from San Francisco to Honolulu), free matter delivery is not a viable option under centralization. Therefore, NLS and the network are faced with the choice of either the non-participation of Hawaii in centralized service, or the participation of Hawaii with some alternative, faster form of delivery.

Alternative parcel delivery services and costs were examined for USPS first class (priority) service and UPS two-day air service (UPS has no other service to Hawaii). In the case of the USPS, priority parcel service would take three-to-four days for delivery and cost approximately $10,000 per year for deliveries and returns based upon current circulation, and would cost approximately $18,000 per year based upon pro forma circulation. In the case of the UPS, two-day air service would take two days for delivery and cost approximately $28,000 per year based upon current circulation, and would cost approximately $49,000 per year based upon pro forma circulation. Given these two alternatives for expedited delivery, the USPS service is clearly more economical and would deliver books to Hawaiian patrons in the same amount of time as deliveries made in the continental U.S.

Appendix 2-25 also contains a calculation of the occupancy costs for the storage of the current (FY91) braille collections in Hawaii based upon unit occupancy costs derived in the previous study (1990). This annual occupancy cost is approximately $17,800 per year, which significantly exceeds the lower of the two USPS priority service cost estimates and is only $200 lower than the higher (pro forma) USPS priority service cost estimate. It is, therefore,

recommended that Hawaii participate in centralized service, furnish its collection to the centers, and receive braille service via USPS priority service.

2.11 POLICY DECISIONS TO BE MADE

There are several policy decisions that must be made by NLS and the network regarding operations at the centers. These issues are listed below.

2.11.1 Loan Limit

An enforced book/magazine number loan limit should be established. There is some flexibility as to what this limit should be. However, there is a maximum number of copies per patron beyond which, in theory, one patron would encroach upon the books/magazines available to another patron. This theoretical limit is: 507,556 copies/20,264 patrons = 25.0 copies per patron. However, it is estimated that, on average, there would be only about four (4) copies outstanding per patron at any instant in time. Therefore, in reality, the potential exists to increase the limit beyond 25.

2.11.2 Loan Period

A book/magazine loan limit should be established (reference ALA standard 3.2.3(b)) that is at least a suggested limit, and when materials are outstanding by some established time period beyond that limit, the patron should be contacted. It is recommended that this period be at least six weeks, but no more than six months. Three months may be an adequate, appropriate time (with exceptions granted).

2.11.3 Separate Rules for Institutions

It may be prudent to have different rules for book number loan limits and loan periods for individuals and institutions. It is recommended that the book number loan limit be the product of the number of eligible readers in an institution multiplied by the established book

number loan limit for individuals. With regards to book loan time limits, there is no analogous extrapolation of individual standards to institutions.

2.11.4 Reference Books

A decision needs to be made with regards to very large braille books, e.g., World Book Encyclopedia, as to whether they should be stored in/distributed from the centers, or should remain in regional libraries for strictly walk-in and browsing use. The Advisory Committee determined that these types of books would probably be most useful if housed with browsing (deposit) collections in network libraries after centralization implementation. However, it would also be beneficial to have some of these materials in the centers. Therefore, the current quantity of such books needs to be determined so that NLS and the Advisory Committee can determine the appropriate allocation among the two centers and network libraries.

SECTION 3

AUTOMATION REQUIREMENTS

BEST COPY AVAILABLE

Section 3
AUTOMATION REQUIREMENTS

This section of the report presents a description of the automation requirements in support of the centralized braille book storage and distribution systems options evaluated. The information contained in this section is for system design purposes only and should not be interpreted as a system specification. System specifications will be developed in Study I, Part 2 of the overall study effort.

3.1 OPTIONS EVALUATED AND DEVELOPED

This section of the report presents a discussion of the automation options evaluated and descriptions of the configurations for Options A, B and C, and a discussion of how these options were developed. Based upon the results of the second meeting with the study Advisory Committee on October 13 and 14, 1992, several fundamental changes were made to Option A, which is the recommended and selected option for centralized braille services.

Capacity requirements have been estimated to include information that would be stored and processed in the system, the sizing of the records contained in the files, and the types and quantities of input and output transactions. Also incorporated is an explanation of the expected types of internal and external queries, and a discussion of the volume, format and types of users executing these queries.

System requirements have been defined covering such topics as general system needs, such as training and documentation, the functions and utilities the system should provide such as "Has Had" and bar code capabilities, the network requirements and configuration, and system security to include access levels and primary controls. Hardware requirements in terms of data storage, data processing and telecommunications are provided. Systems and application software requirements are presented, including off-the-shelf versus custom software issues. Staffing requirements and space requirements in support of the automation effort are presented, as are the estimated costs of hardware including maintenance and installation, software costs including

installation, modification and maintenance, and telecommunications hardware and communication line costs.

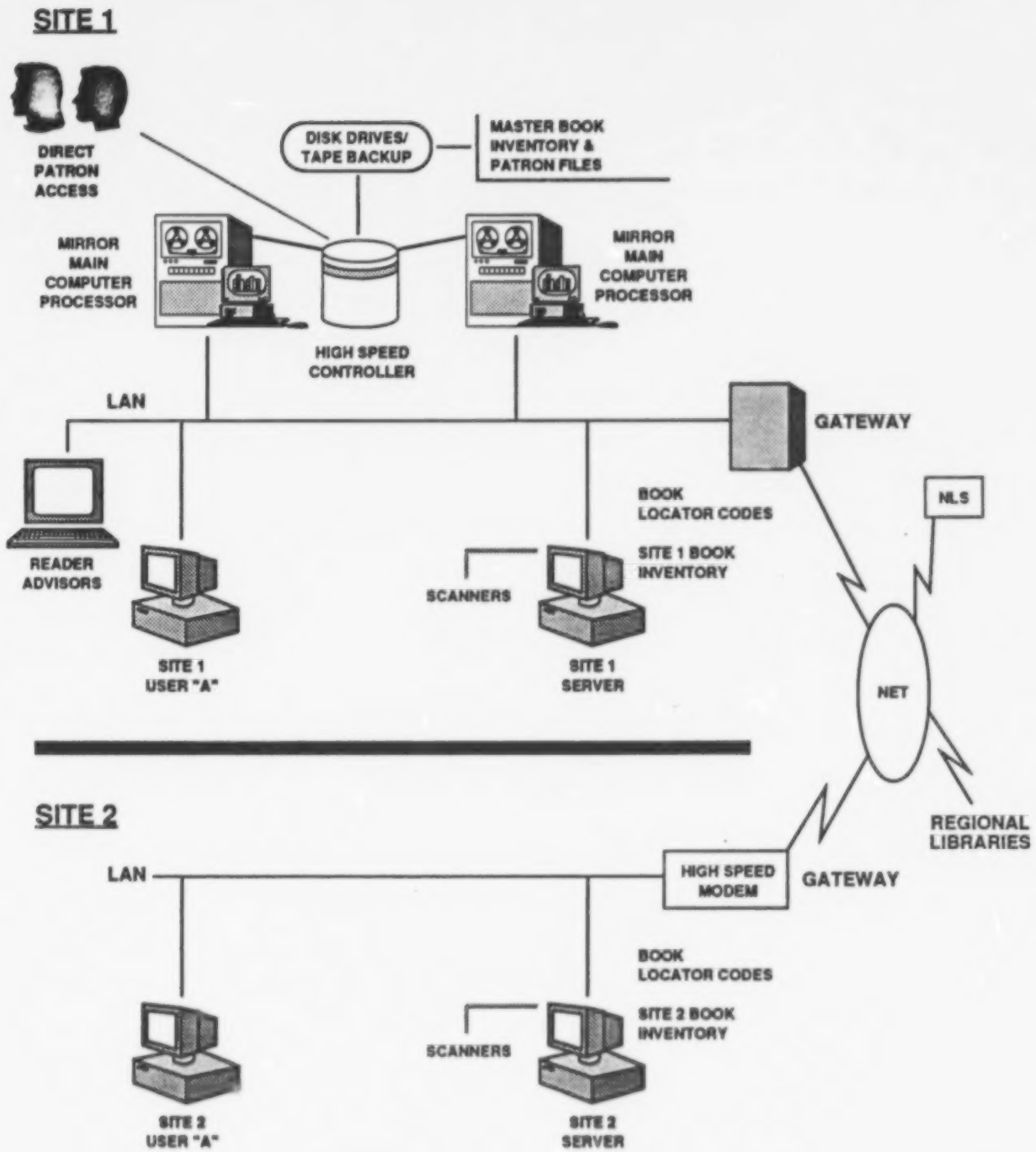
3.1.1 Full Patron Service (Option A)

The requirements for Option A, the recommended and selected option, provide for full professional reader advisory staff located at one (hereafter referred to as the "primary") of the centralized braille distribution centers. Under this option, patron reader advisory services for braille books would be provided by the primary center, but it does not preclude reader advisor services being provided by regional libraries as well. The reader advisors, wherever located, would require full automation support in order to respond to a patron's request for service. Patrons would call the center (via 800 telephone lines) and be provided with essentially the same scope of services now being provided by the braille regional libraries. The only essential differences are: patrons would normally continue to be registered by the network libraries (except for patrons from non-participating states) and the registrations forwarded to the center using CMLS or some other similar process that requires single notification to NLS; and, the profile select function, performed at the center, would have braille book Has-Hads but none of the other media historical data. An automated interactive voice response (IVR) capability would be provided to permit direct patron access to the system to include ordering books and obtaining book request and inventory status information; registered patrons would call the center (via 800 telephone lines) to access the IVR unit from their touch-tone telephones. Regional libraries would have access to the system's database by means of an error checking (Asynchronous) 2400 or 9600 baud modem, communications protocol software (TCP/IP, SNA, etc.) and a Wide Area Network (WAN). The reader is referred to Appendix 1-1 to review the required characteristics of Option A as formulated by the Advisory Committee, NLS and ManTech.

The Option A automation configuration is presented in Exhibit 3-A. The system data processing requirements for this option can be divided into three categories, all of which must be able to function simultaneously. These categories are:

Exhibit 3-A

CENTRALIZED BRAILLE CONFIGURATION
OPTION "A"



1200-10

- Transaction Applications - Transaction processing would provide the reader advisors and other users at a terminal workstation, wherever located, access to the centralized database via an interactive time-sharing mode to either query data or modify the contents of the database. It would also include direct patron orders placed upon the system via the IVR feature. Transaction processing is interactive in that every input transaction is followed by an output message to the terminal. The message contains either an answer or a validated update response. These transactions may include, but not be limited to: requesting a book, looking up a title, or changing a patron's address.

- Remote/Local Batch Processing - This system category consists of predefined run streams invoked from user terminals at local or remote sites. This capability permits the user to start a batch job from the interactive mode of processing. Once the job is entered, control passes to the batch facility and the job is completed accordingly. This facility is used by the center operations staff for performing pick-ticket runs for the primary and secondary facilities and retrieving data from the communication services.

- Communications - The system requirements for communication services include intra- and inter-center communications, a telecommunications data link to allow access by network libraries that choose to provide reader advisory services, direct patron access via the IVR feature, and access to CMLS, NLSNET or some other yet to be determined single notification point for patron information.

3.1.2 Circulation Service (Option B)

Option B does not provide reader advisors at the braille distribution center. Under this option, patrons requiring reader advisory assistance would be supported exclusively by the regional libraries. Assistance to call-in patrons would also be provided by the clerical staff at the center for placing specific orders or querying inventory and order status, but not for reader advisory services.

In this option, a "modified profile select" would be performed at the network libraries, whereby a "wish list" of specific titles would be generated and transmitted to the center in batch before a specified cut-off time. The term "wish list" is used because inventory availability at the centers would be unknown to the network libraries, which is a disadvantage relative to Option A. However, in this option, there is no possibility of the duplication of titles in different media being sent to a patron, which is an advantage relative to Option A.

In every other respect, Option B is identical to Option A. There would be a data telecommunications interface with regional libraries and an IVR capability identical to that for Option A. The Option B configuration is presented in Exhibit 3-B.

3.1.3 Storage and Mailing (Option C)

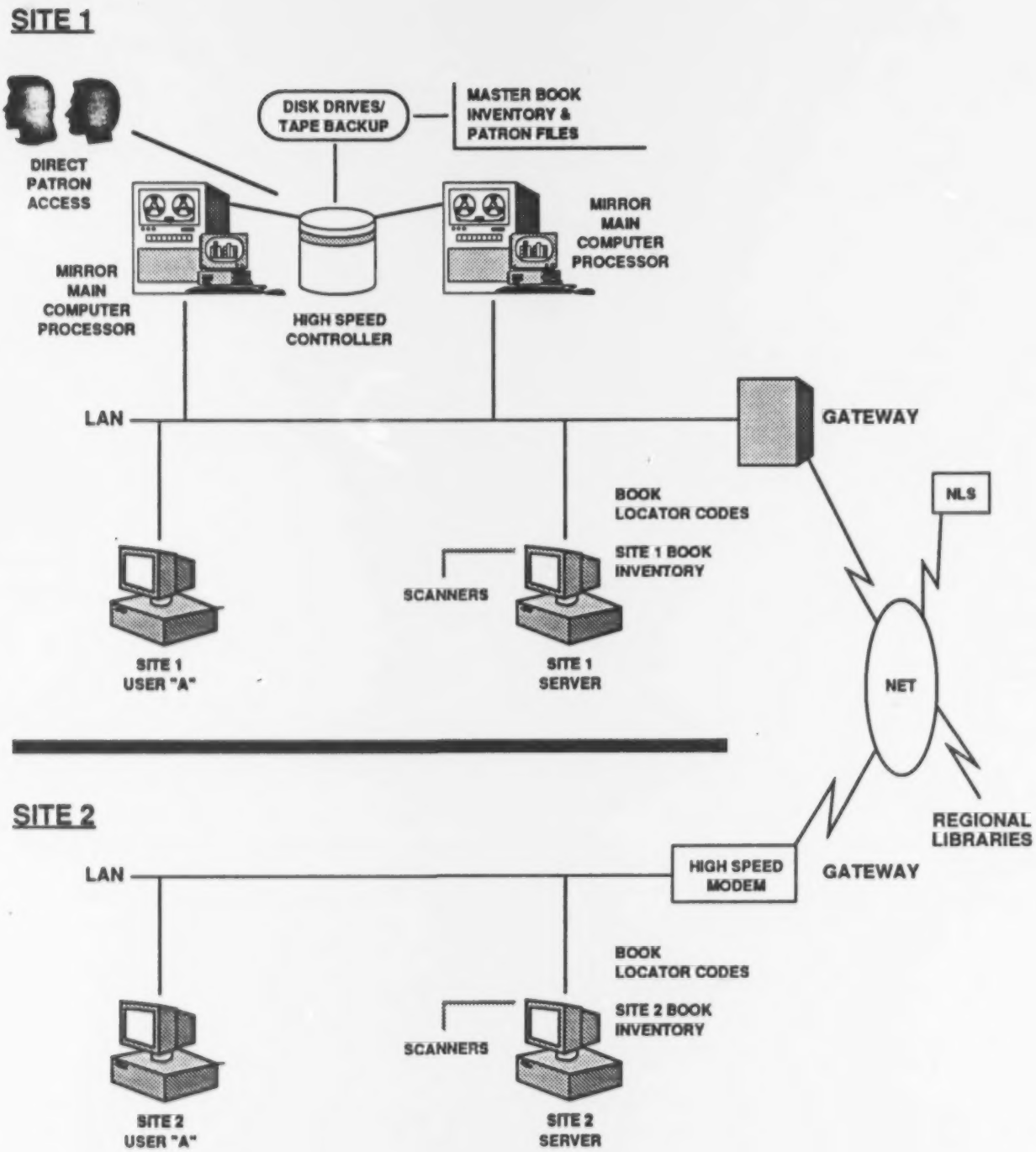
The design for Option C is for all direct patron service to be provided through network libraries; there would be no patron contact whatsoever (mail, voice or IVR) with the primary center. Data system support for the network library based reader advisors would be provided as described in Options A and B. There would be neither 800 lines for patron voice communications with the center under this option, nor an IVR capability. The Profile Select capability would be identical to that for Option B. The Option C configuration is presented in Exhibit 3-C.

3.2 CAPACITY REQUIREMENTS

In this section, the required system capacities associated with data storage and processing, the sizing of the fields and records contained in the database, and the types and quantities of input and output transactions are defined. Also included is a definition of the capacity requirements related to internal and external queries including volumes, formats and the types of users generating these queries. Capacity requirements as presented in this report were established to define the system design, and the sizing information should be considered an estimate, and may change during specification development.

Exhibit 3-B

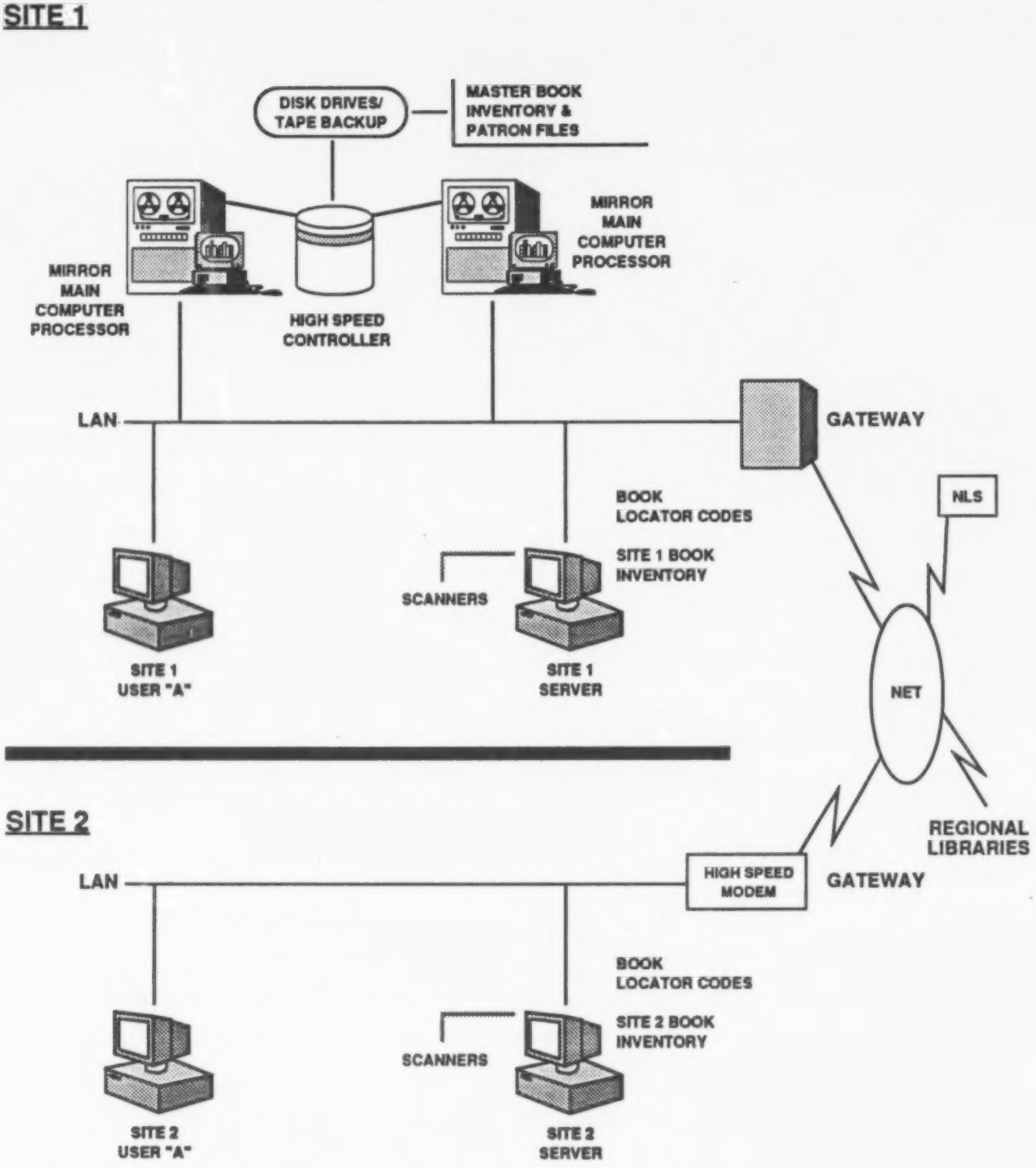
CENTRALIZED BRAILLE CONFIGURATION
OPTION "B"



1200-11

Exhibit 3-C

CENTRALIZED BRAILLE CONFIGURATION
OPTION "C"



1200-12

3.2.1 Database Environment

The database environment was developed after an examination of several systems currently used by the network. These programs included Data Research Associates (DRA), Keystone (KRAS), the Pennsylvania Consortium, the Texas System, the Utah System and READS. Each system was examined, to the extent information was provided by the vendors or designers, and the attributes best suited to the envisioned centralized application were selected.

The computations in support of this sizing estimate are contained in Appendix 3-1. This information was developed considering the location of the data storage, and individual records were sized based on their applicability to each option evaluated.

File Sizing

In determining the required fields and record layouts for the center's system, each software package identified above was analyzed to select required information while maximizing economy for memory utilization. As previously discussed, it is recommended that the automated system support the use of bar coding. The bar code feature would reduce the amount of space required to store patron and braille book detail data at the subsystem (East/West) level and, in conjunction with the fact that the database would store only information on braille media, would substantially reduce the amount of data to be stored on the system relative to one supporting multiple types of media.

The Primary database would consist of 10 record layouts, which are the; Patron Main, Patron Checkout, Patron History, Patron Reserve List, Book Record, Book Bar Code, Master Book, Master Bar Code, Magazine Record and Magazine Bar Code. Each record would contain a common identifier which would link it to related records. The Patron records would be linked by the field Patron_ID, which would be the same as a patron's CMLS ID. The Braille Book/Magazine records would be connected by means of the fields Title_ID, Master_ID and Mag_ID. The Eastern subsystem database would contain two records, the Sub Book and the Sub

Magazine, while the Western subsystem would have three records, the Sub Book, the Sub Master and the Sub Magazine.

Patron Information

The Patron Main record for Option A would contain 401 bytes per patron, and the entire Patron Main file would require approximately 8 megabytes of disk storage to accommodate the current braille readership. Options B and C would require 169 bytes per patron, and require 3 megabytes of disk storage to store patron information. The subject matter contained in the patron record is considered standard based upon the databases reviewed. The fields for the Option A record are the patron's identification code, name, address, alternate address, point of contact and phone numbers. The Option A record also contains the patron's language, date of birth, sex, disability, patron activity (first & last date), subject interest codes (32), restrictors, profile select option, number of books checked out, patron type (Individual or Institution), frequency of desired service (daily, weekly, etc.) and home regional library. In Options B and C, patron reader profile information would be stored at the regional libraries, and would eliminate the need to store this type of data on the Primary system, i.e., only basic patron information would be maintained to include patron id, name, address and alternate, frequency of delivery and the home regional library of the patron.

The Patron Checkout (Has Now) record would consist of four fields and apply to all three options. These four fields are the patron's identification code, the title identification, the unique volume number and the date the book was sent. Given a 25 book limit per patron established for design purposes, the size of this file results in a requirement of 14 megabytes of disk storage. This value represents the maximum requirement in the unlikely event that every patron would have 25 books checked out.

The Patron History record (Has Had) has been designed to store the least amount of data possible to facilitate the profile select capability. Storing the Has Had record on disk in the distribution center computer applies only to Option A, since this data would be stored in the regional libraries under Options B and C. The Has Had record consists of two fields, the patron

id and the title identification. File size estimates for the Has Had records were based on the current per patron circulation of 10 books per year and the assumption that a ten-year patron history (on average) would be transferred from network libraries to the primary center. This function would, therefore, require disk storage of approximately 46.2 megabytes the first year, and based on a 1.5% patron net growth for five years, would eventually require 63 megabytes of storage to accommodate five additional years of data.

A record was designed to accommodate patron orders which could not be satisfied at the time of the request due either to book unavailability or to a patron being over quota. These records would be held in a Patron Reserve List, which allows each patron to store up to 50 books on their reserve list. Based on this 50 book ceiling and the maximum number of patrons, this file would require 29 megabytes of storage.

Collection Information

The inventory records (braille books, braille masters and magazines) are identical for all three options. Each title in the inventory has three records linked by the Title_ID field. The first record provides title information, the second record identifies the title and volume by bar code number (both are maintained on the Primary system), while the third record is located on the subsystem and houses two bar code numbers, title identification and location.

The first record holds the majority of the inventory information and is identified as the Book Record. This record stores the BR, BRA, BRF, BRJ, BRX, and PRE 13,000 collections and information in this file provides only a description of the title, not the volume. This record also contains the title identification along with the title name and four subject codes. There is also additional information which includes the author's name, originating date, an abstract with a reference identification code, and subject matter indicators to cover profanity, sex, violence, grade level, adult or youth, and language. This file was sized using the total number of titles currently in all collections (28,983), which when multiplied by the record length yielded a storage requirement of 14 megabytes.

The second linking record would be used to track each individual volume of the braille book collection and would be named the Book Bar Code. This record would contain three fields; the title identification number, the title volume number and the title bar code. The title bar code field would contain a unique identifier that would identify an individual volume as a unit of inventory that would be linked to the Title_ID and Volume Number, and would be used to track the item. The total file size for this record is estimated as 37 megabytes, assuming all collections (1,230,996 volumes) are to be managed by the centers.

The third record tied to the Book Record is the Sub Book, which is stored on each subsystem in the center wherein the braille book is physically located (East or West). This data is used to identify the shelf slot where the book is located in the stacks. This record consists of 2 fields, the title bar code and the title bar code locator. The title bar code is linked to the Primary system, and the location bar code indicates shelf position. The sizing of this file was based on the total volumes to be stored at each location (East or West), and the initial capacity requirement would be approximately 11 megabytes in the West and 18 megabytes in the East. These capacities are based on the storage of 472,385 volumes in the West and 758,611 volumes stored in the East.

Records for the BRA Masters would be maintained in a separate table (Master Book) and are configured in the same manner as the Book Record. This record would be comprised of basic title information to include the title ID, title name, author, origination date, abstract and language. There are 4,307 BRA Masters currently in the MSCW inventory, and based upon a total record length of 496 bytes, the size of this file would be 2 megabytes. These books would be stored in the West facility only.

A second record is used to trace the Braille Master books by volume and is labeled the Master Bar Code, and is identical in structure and function to the Book Bar Code record. The total file size for these records is approximately 822 kilobytes.

The third record related to the Master Book is the Sub Master and is identical in structure and function to the Sub Book record. The initial capacity requirements would be approximately 705 kilobytes for this file.

The magazine records would be used to identify the back-issue magazine collection. Although this media has very little circulation, the same considerations used for braille books were applied for estimating capacity requirements. This file contains three records, the Magazine Record, the Magazine Bar Code and the Sub Magazine. The first record, called the Magazine Record, provides a description of the magazine, and contains the magazine identification along with the magazine name, volume identification, issue date and subject matter. The storage requirement for these records was quantified considering the total back-issue magazine collection stored in the MSCW (7,496 copies), and is approximately 1.2 megabytes.

The second of these records would be used to track the back issues of braille magazines and would be identified as the Magazine Bar Code, and would contain three fields, the magazine identification, magazine bar code and magazine shipping date. This record is identical in structure and function to the Book Bar Code and Master Bar Code, and the total file size for this file is approximately 102 kilobytes.

The third and last record associated with the Magazine Record is the Sub Magazine, which is identical in structure and function to the Sub Book and Sub Master records. The space requirements for this file would be approximately 88 kilobytes at each subsystem site, East and West.

The total memory required to support the primary system for Option A would be approximately 113 megabytes, while Options B and C would each require 75 megabytes based on current operations. Allowing for 3% annual growth of the system across the board for seven years, the capacity requirement for Option A would be 139 megabytes, with that for Options B and C being 92 megabytes. The western subsystem would initially require 12 megabytes, and the eastern subsystem 18 megabytes of memory. Using the same growth scenario as for the

primary system, the western and eastern systems would require 15 and 22 megabytes, respectively.

Input Transactions

The types of input transactions being entered into the centralized database would consist of actions relating to the Patron and Title records, and could be entered by any user on the network having the proper access authority. This would be reader advisors/clerks under all options, and patrons using the IVR feature in Options A and B.

The Patron file would contain a utility that would allow the user to add a patron, update a patron record or delete a patron from the database. Additions for patrons from nonparticipating states would be registered using a center generated patron ID compatible with CMLS format. In concert with this feature would be the patron profile set-up function, which would permit the user to establish a specific patron profile. The add/update/delete patron utility must be available for each option, however, the amount of data being entered in the patron record under Options B and C would be substantially less than that for Option A, because the patron profile function would not exist under Options B and C (profile select is performed at, and the responsibility of, network libraries). In Option A, the format for these transactions would be consistent with the Patron Main record, contained in Appendix 3-1. With regard to Options B and C, only the patron name, address/alternate address, frequency and regional library affiliation would be added/ updated/deleted using the format shown in Appendix 3-1. The volume of activity associated with these transactions is contingent upon patron growth and change.

The title input transactions would be associated with four actions: 1) title identification, 2) title abstract, 3) title check-in, and 4) title check-out. The title identification and title abstract transactions would consist of three options; add, update, and delete. These utilities would permit a user to manipulate the data fields in any one of the three title records (Braille Books, Braille Masters and Magazine Record). The format of these transactions would be consistent with the record layout of each file, and the volume of these transactions would be based upon the number of braille books and magazines appended to the existing collections (e.g. 325 BR titles per year).

The title check-in transaction would be a fully automated bar code scanning process, which involves the unique item identification code which interfaces with the book inventory, the patron Now Has records and the patron Has Had records. With respect to Options B and C, the Has-Had record would be maintained at the regional libraries. Assuming that all braille volumes checked out would also be returned, this function would occur 506,150 times a year. The check-out transaction format would involve four data fields; patron ID, title ID, volume number (item identifier) and date sent. As with the check-in process, this operation should occur 506,150 times per year, and would impact the title inventory file and the patron Now Has file.

Output Transactions

Output transactions would include mailing card/pick ticket generation and several types of management reports. These types of transactions would apply to all options, with the exception of certain patron data not applicable in Options B and C, and would be entered by any user on the network having the proper access.

The mailing card transaction would produce the pick tickets (Ref. Appendix 3-8) by which books would be removed from the stacks and forward shelves. This process would utilize two bar code fields, the title bar code and the title locator, the volume of transactions would be 506,150 a year, and it would print tickets in stock location sequence.

The report generator would create management and statistical reports for NLS and network library use. This application should produce reports on circulation, inventory, "patrons due for service" (to be acted on by regional libraries), material overdue, patron statistics and patron Now Has data. The format and frequency of generation of most of these reports would be conditional upon management needs and demands, although the "patrons due for service" reports should be produced daily, as should the Now Has file data that must be passed back daily to the regional libraries in Options B and C.

3.2.2 Internal and External Queries

The automated system applications supporting centralized braille operations would have the capability to perform data queries. This query capability would be designed to provide for both internal and external inquiries, and the types of queries available, and the accessibility to users, would be contingent upon the option being implemented.

Internal Queries

For purposes of this discussion, internal users are defined as individuals not requiring a modem to access the system, and would include users physically located within the primary facility. In Option A, the center's Reader Advisors would have direct access, via the local area network, to the system. Queries available to RAs would include patron information (address, telephone, etc.), profile data, quota statistics and frequency of service, and book information and availability. This functionality would also be available to reader advisors located in regional libraries under all options. The physical location of books would only be accessible to users of the subsystems in the floor operations.

External Queries

External queries are defined as being from users who must access the system via modem, which includes the secondary site and the regional libraries under all options (in Option A, those RLs that elect to provide their own RA services). NLS and regional libraries would have the capability to query data files in the system via a Gateway and high speed modem communications network. Regional library patron query capability would, however, be limited to those patron records containing that library's identification.

3.3 SYSTEM REQUIREMENTS

A systems requirements analysis was conducted for each of the three options under evaluation, and the automated system selected for use at the centers must meet the requirements

subsequently outlined. System requirements were organized into four categories: 1) General, 2) Operations, 3) Network, and 4) Security.

3.3.1 General

The general category identifies requirements which are indirect and overarching in nature, yet play an important role in the success of any system implementation. This category includes the user interface, supporting documentation, follow-on maintenance and support, and the level of training required and provided.

User Friendly

The software and hardware selected for the system should interface with the user simply and with a logic that is easy to understand. The system should have an intuitive user interface that provides the user with clearly defined menus that are uncomplicated to follow.

Detailed Documentation

The hardware and software selected for this centralized system should be well documented. At a minimum, software documentation would include a comprehensive user manual and a detailed operations manual. The hardware documentation should be easy to comprehend and provide detailed instructions for troubleshooting the components and system as a whole.

Maintenance and User Support

Based on the hardware and software selected, each center should be provided strong systems maintenance and user support, with priority on the primary system. From a hardware viewpoint, the systems vendors must provide maintenance on-site at both centers. The vendors should provide hotline support, and costs should be based on use.

Training

Training should be provided for every part of the system so as to eliminate or reduce vendor dependency. Training programs offered should ideally be provided on-site at the centers, or alternatively at the vendor's location, and should be designed for the non-computer-literate user.

3.3.2 Operations

This section details the operational features required to provide automated support to centralized braille distribution operations. These requirements are based upon the premise of providing at least the same level of support as is currently being provided at the braille libraries visited during this study with respect to patron services, and also on supporting centralized braille operations with respect to streamlined distribution operations.

Menu Driven Capability

Any software selected and/or designed must use a menu screen approach. The menus must be simple in design and be comprehensible by non-computer-literate users. These menus could be windows driven, however, and the logical process and positioning of these windows must be effortless to understand.

Patron Information Capability

The system must be designed to permit the user, with the proper security access, easy entry into the patron database. Menu options should be constructed to provide a clear path for users to query the files on specific information, such as patron address, subject interests, etc. Updates to the patron file should be developed as an automatic process/exchange of data between activities, whether the requested change (i.e. change of address, POC, etc.) was processed by staff at a regional library, or at the center. These functions should be as easy to operate from a remote

site as they are for a local user, and all communication connectivity should be invisible to the user.

Book/Magazine Availability Information Capability

Accessibility to inventory data should be controlled at each critical level, yet be simple enough to accomplish once the user is past the system security. As with patron information availability, menu options should be designed to supply users with an unobstructed query path to files for specific data, such as abstract information, subject codes, etc.

With regard to Options A and B, patrons should be able to order books directly on the system via the IVR feature. This interactive system should provide voice responses to query/ input initiated by the patron via a touchtone phone.

Conventional Circulation Capability

Any system must support book circulation and control. Circulation procedures should be initiated by selecting the appropriate menu option which would empower the user to obtain specific information such as book availability, abstract details, etc. as well as initiate an order or place a reserve to fill the customer request. This circulation capability should be able to credit the inventory record and debit the patron file, and vice versa.

Profile Select Circulation Capability

The profile select circulation capability should be able to choose braille books for patrons based on a predetermined reader profile, patron history, and book availability, and is only applicable to Option A (regional libraries generate a "wish list" of titles in Options B and C via their own profile select routines). This function should have an option that allows the user to specify whether or not the patron wants the service, and how often books would be selected for a patron (weekly/monthly, i.e. calendar service, or turnaround service). This capability could differ in algorithm details, but should select materials using a systematic approach. The initial

step would be for the system to identify the patrons on profile select, how often they want the service and whether they have met their quota of books. Profile select would then select titles for the patron based on the reader profile, titles that the patron has had or now has would be eliminated from consideration, and checks would be performed to determine if the book is in the inventory. If the book is available, the system should generate a pick ticket.

Request and Reserve Capability

The ADP system must be designed to accommodate patron backorders, i.e., a mechanism which will store orders that cannot be fulfilled at the time they are placed with the center. There are two possible types of backorders which differ depending upon the urgency with which the materials are required by patrons. The most common type is a "request", which is a backorder for materials of average priority. The second type is a "reserve", which is a backorder of high priority. Reserves must have priority over requests, even if a request was placed prior to the placement of a reserve.

These backorders could be placed in a single queue, or two separate queues, depending upon the specific design of the system's database. If a single queue is used, there must be a data element distinguishing reserves from requests so that reserves are fulfilled before requests when the materials are available for issue. It has been recommended that this backorder queue (Patron Reserve List) accommodate a maximum of 50 books. If this limit needs to be increased beyond 50, a new value will be specified in the system specifications to be developed in Part 2 of the study.

Has Now Capability

The system should keep track of what titles, and specific items, patrons have in their possession. The file that supports this capability should store the patron identification, title identification, volume number and date sent information. This operation should also be able to generate hardcopy and on-line Has Now listings both on request, and automatically.

Has Had Capability

The system should be able to track the braille books a patron has read. This file's records should consist of the patron ID and title ID fields. As with the Has Now utility, this operation should also have a procedure which permits a user to quickly list what a patron has had. These records would not be retained in the center's ADP system under Options B and C (there would be a "pass-back" of Now Has data to the regional libraries), but would be retained under Option A.

Bar Code Capability

The system should interface with bar code equipment, and specifically include the capability to accept input from bar code scanners, and to generate bar code printer output. The interface with the bar code scanners would be through radio frequency communication links through which receiving, order filling and putaway functions would be performed. The bar code printers must support both textual printing of patron and book information, as well as USPS bar coded zip codes and a transaction bar code for internal use.

Quick Turnaround Capability

The automated system supporting centralized braille distribution must also support "quick turnaround" of books. Inventory in the temporary holding area (forward shelves) from which quick turnaround would be performed would have a priority over the same titles stored in the stacks in the picking sequence. This procedure would only apply within a center, and books requested from the eastern region would not be selected from the west forward shelves unless the book is not available in the east inventory.

Random Book Storage

The system must have the capability to track the location of braille books and magazines throughout the centers when stored in random sequence. Books and magazines would be stored

in one of three locations: (1) forward (temporary) shelves, (2) stocking carts, or (3) mobile shelving, all of which would have bar code labels that would identify distinct shelf slot locations. As books and magazines are placed in storage locations, their bar code labels would be scanned and then the shelf locator bar code would be scanned to establish the location for that item. The system must also print the location of an item on the pick ticket, which requires matching the item identification to the item's location. Location information would only be stored at the subsystem level, not on the primary system. Since these subsystems would be the only source for this data, this location information must be backed up on a regular basis i.e., at least daily.

Direct Patron Access Capability

In Options A and B, there would be a capability whereby the patron can order a book via a touchtone telephone. This function would be performed using an interactive audio voice response (IVR) system. This system must have the ability to query the databases, search the data files for the correct answer to the patrons request, translate this data into a digitized form and generate an audible reply back to the patron. The selections from the system must be simple in nature, and provide no more than three alternatives per question. This process should be able to generate an inventory transaction and pick ticket like any other circulation transaction and should also have a reporting capability to include number of calls processed, length of call, number of requests filled, etc.

The basic procedures which define this utility are outlined in a flow chart in Appendix 3-2, and are listed below.

- Receive Call - When a call is received, the system should provide a welcome statement along with a short explanation of how the touch-tone system operates. This should be followed by a request for a user identification number.

- Enter I.D. Number - Once the user enters the I.D. number, the system should read the number back to the user and provide the user with the option to verify or re-

enter the I.D. number. The system should then check the database to ensure that the I.D. number is valid.

- Validate I.D. Number - The system should perform a search of the database to verify the I.D. number. If this I.D. number is not in the database, the system should advise the user that the number is not valid and provide them with the option to re-enter the number or to contact the database administrator. Based on the latter response, the call should be terminated following the user's response. If the I.D. is valid, the user should be asked to enter the number of the book they want.

- Enter Book Number - The user would enter an eight digit book number, and the system should read the number back to the user and provide the user with the option to confirm or re-enter the number. The system should then check the database to ensure that the number is valid. If this number is not in the database, the system should advise the user that the number is not valid and provide them with the option to re-enter the number or to contact the database administrator. Based on the latter response, the call should be terminated following the user's response. If the number is valid, the system should check for the availability of the item ordered.

- Book Availability - Once the order code is verified, the system should determine if the item ordered is in the inventory by conducting a search of the database. If the item is not available, the system should allow the user to: 1) enter another book number, which ignores the previous request, or 2) add the book to a request or reserve list and enter another book number, or 3) terminate the call. If the item is available, the system should indicate to the user that the item is being placed on order, and additionally announce the number and the title of the book ordered. This process should be followed by an option to enter another book number or terminate the session.

Data Backup Capability

As indicated in the overview of this section, data redundancy and backup is required for this centralized approach. The system must have a set schedule for backing-up data on the primary and subsystems. At a minimum, the primary system should be backed-up on a daily basis. This should be sufficient given that mirror systems would be operated at the primary level (ref. Section 3.4.5). The subsystems should be backed-up at least once, and preferably twice a day, and every time a major change occurs in the book inventory.

Other Possible Features

At the second Advisory Committee meeting, the issues of the primary system's ability to both access the BLND collection (with a full MARC record), and the possibility of offering a Public Access Catalogue feature were brought up. If NLS and the Advisory Committee believe that these two features are desirable and should be essential functions of the Option A ADP system, ManTech requests that further information be provided on the location, size, and structure of, and future plans for, these databases, and the incremental costs of including those features under Option A will be estimated during the specification development phase.

The key issue to be resolved, which is dependent on the size of the databases and the ways the information can be accessed, is which of three potential ways should this information be made accessible to primary system users. These three ways are: (1) on-line database housed on hard disks on the center's system, (2) on-line database housed on a CD-ROM based, optical drive (possibly a juke box, depending on size) subsystem peripheral, or (3) modem access to the databases, with or without a "windowing" feature.

3.3.3 Network

Networking hardware and software is required to support internal and external users of the centralized braille book storage and distribution system. There will be two methods for

accessing the system: a non-local area network ("non-LAN") method, which must also support dial-up capabilities for remote users; and a LAN method for intra-facility communications.

Non-LAN communications requirements include: uploading and downloading files between the primary and secondary centers; downloading patron information, and new titles descriptive and ordering information, from the network libraries and from NLS, respectively; and interactive accessibility to the primary database by network library reader advisors for placing orders, making queries, and modifying patron profiles. This type of accessibility would require lease services to a wide area network (WAN), a network hub interface to the WAN for the primary site, and software for the appropriate inter-networking and transport protocols (e.g. TCP/IP, SNA, DECnet).

LAN communications requirements include an integrated intra-facility capability that permits all local users to share databases, printers, and other ADP resources. This capability would require a network interface for each of the devices/nodes attached to the LAN, cabling, and the appropriate networking software (e.g. Novell Netware).

NLSNET Compatibility

The NLSNET system uses an electronic data interchange store and forward capability whereby NLS and the network libraries store data files which are later retrieved by NLS, NLS vendors, and multistate centers for batch processing. There exists a possibility that the proposed system could interface with the NLSNET system for the purpose of retrieving patron information from the network libraries and descriptive and ordering information on new titles from NLS. This information would be captured in electronic form, reformatted and entered into the centralized database. Such an interface would require modifications to the existing NLSNET functional capabilities, files, and formats in order to deliver the required information to the centralized system. With regard to the patron information, there also exists the possibility that CMLS could serve as the "single notification" point to NLS; however, this would require some modifications to CMLS.

3.3.4 Security

Since the envisioned system would be designed to operate in a network environment, system security levels must be established. System security should employ user passwords in conjunction with limited data access based on "a need to know", and each security level should be founded upon the user's purpose of entry into the network.

Primary System Security

Each function within the primary system should be controlled separately. The individual administering the system, including system utilities, should have a different access control than the database administrator. These types of functions should not be accessible to any other users on either the Local Area Network or in remote locations.

Access Level Security

Each option evaluated for this centralized approach would have varying degrees of access to the databases. Reader advisors (wherever located) would have individual passwords which would limit them to a menu utility that provides them access to patron and title information. Reader advisors in the centers, for Option A, would have access to all patron records, while reader advisors in regional libraries would have access only to patron records with their own library code under all options. The NLS would have the same access level as the center's reader advisors. Floor operations personnel would have access to inventory data contained on their subsystem server at their own location; this would be the same for all options. Any interface between the primary system and the subsystems would be via a multi-directional batch processing routine, and floor operations users would not have access to the database on the primary system. Options A and B provide for direct access for patrons for requesting specific books, and this utility should allow the patron to place orders after patron ID verification.

3.4 HARDWARE REQUIREMENTS

The architecture of the system would be configured as a series of nodes participating in a LAN. Users and peripherals would interact with the system through a network node or through a communications gateway, interactive voice response channel, or modem. The system architecture would require a primary system database server node for storage and access to the major assets of the database files. Both the primary and secondary site subsystems would require an inventory server node which would provide maintenance and storage of each site's inventory database, and one or more network user nodes for on-site clerical and reader advisory access. Furthermore, hardware selected for this system must be accessible to all employees, via adaptive devices if necessary.

3.4.1 Database Server

A primary system database server node, with a dual-redundant hardware architecture of two complete processing systems and no single point of failure that operates in a fault-tolerant environment, is required for the primary site facility. The database server would: function as a multi-user computer operating as a node in an integrated local area network environment; support remote users accessing the database via modem and a communications gateway; support local users accessing the database across the installed LAN; and support patrons accessing the database through an interactive voice response channel.

The server would utilize its local resources to provide storage, software support, and communication services to network users. The components, capabilities and features listed below are the minimum requirements for the database server in such a system configuration.

- Central Processing Unit (CPU)
  - Two (2) interconnected CPUs, each with sufficient internal storage to perform all required system functions, capable of operating as a redundant, fault-tolerant node on a local area network.
  - A 32-bit or greater architecture including a 32-bit word length and data path between the CPU and memory.

- Virtual memory operation capable of processing batch and interactive jobs concurrently.

- Support for a floating-point math co-processor.

- Cache memory to increase overall system performance.

- Error checking and correcting system architecture.

- An interrupt control and automatic system restart facility that automatically returns the system to an operating condition after certain types of interruptions and errors (e.g. power outages).

- A real-time clock/calendar with battery backup.

- Additional I/O expansion slots via a non-proprietary, open-system architecture expansion bus that permits the system to be configured with third-party function boards.

• Hard Disk Storage

- Sufficient total capacity to meet permanent and temporary disk space storage requirements.

- Internally/externally expandable to meet future growth requirements.

- Redundant disk modules to permit mirror image recording in order to fulfill fault-tolerant requirements.

- Architecture that uses an industry standard SCSI interface for fast system performance.

• Flexible Disk Storage

- A flexible diskette unit for 3.5" and/or 5.25" diskettes is required.

- In addition to the system's native format, the unit must also read and write diskettes in the 360 kilobyte MS-DOS compatible format.

- Provide a media write protect feature that indicates status to the operating system.

• Cartridge Tape Storage

- A streaming cartridge tape unit, fully enclosed, and capable of storing 525 megabytes per cartridge.

- Sustained throughput rate that exceeds 100 kilobytes per second.
- Redundant electronic logic to fulfill fault tolerant requirements.
- Support read and write transfers on a file-by-file basis, as well as files by directory.
- Ability to read tapes created on another unit.
- Error checking on read operations and read-after-write error checking on all write operations.

• Console Monitor and Keyboard

- Support a system administrator's function through a directly connected console monitor and keyboard.
- Support a color VGA interface with a minimum resolution of 640 by 480 pixels and 16 colors from a palette of 256 colors.
- Use the IBM 101 key enhanced PC keyboard.

• External Interfaces

- The processor would interface with a LAN via redundant network interfaces.
- A minimum throughput rate of 4 megabytes to the LAN.
- One parallel printer port.
- A minimum of four (4) serial ports for use with terminals, printers, modems, and other serial devices is required. Two of these ports must be configurable by the system administrator for synchronous or asynchronous operations.
- The serial ports must provide user selectable speeds of 300, 600, 1200, 2400, 4800, 9600, and 19200 bits per second at a minimum.

3.4.2 Network Nodes

The subsystem for the primary facility and the subsystem for the secondary facility each require an inventory server node and a network user node. The primary site would have multiple network user nodes with one acting as a terminal server supporting network accessibility, while

the inventory network node would provide the interface for the bar-code reading devices used to manage the distribution operations. This node would also process and print the pick-tickets that are used in the selection of a volume from the collection and as mailing address cards. At least one network user node must be configured identically to the inventory node so as to provide a redundant backup capability. The components, capabilities, and features listed below are the minimum requirements for such a network node configuration.

- Central Processing Unit
  - One CPU with sufficient internal storage to perform all required system functions, capable of operating as a network node on a local area network.
  - A 32-bit architecture (e.g. MC68020, Intel 80386) including a 32-bit word length and data path between the CPU and memory.
  - Virtual memory operation capable of processing batch and interactive jobs concurrently.
  - Support for a floating-point math co-processor.
  - Cache memory to increase overall system performance.
  - Error checking and correcting system architecture.
  - A real-time clock/calendar with battery backup.
  - Additional I/O expansion slots via a non-proprietary, open-system architecture expansion bus that permits the system to be configured with third-party function boards.
- Hard Disk Storage
  - Sufficient total capacity to meet permanent and temporary disk storage space requirements.
  - The drive heads must automatically retract and lock in place upon loss of power in order to prevent head crashes.
- Flexible Disk Storage
  - A flexible diskette unit for 3.5" and/or 5.25" diskettes is required.

- In addition to the system's native format, the unit must also read and write diskettes in the 360 kilobyte MS-DOS compatible format.

- Provide a media write protect feature that indicates status to the operating system.

• Cartridge Tape Storage

- A streaming cartridge tape unit fully enclosed and capable of storing 65 megabytes per cartridge is required for the inventory server node and the backup network user node.

- A sustained throughput rate that exceeds 100 kilobytes per second.

- Support read and write transfers on a file-by-file basis, as well as files by directory.

- Ability to read tapes created on another unit.

- Error checking on read operations and read-after-write error checking on all write operations.

• Monitor and Keyboard

- Support the network function through a directly connected console monitor and keyboard.

- Support a color VGA interface with a minimum resolution of 640 by 480 pixels and 16 colors from a palette of 256 colors.

- Use the IBM 101 key enhanced PC keyboard.

• External Interfaces

- The processor would interface with a local area network.

- A minimum throughput rate of 4 megabytes to the LAN.

- One parallel printer port.

- A minimum of four (4) serial ports for use with terminals, printers, modems, and other serial devices.

- The serial ports must provide user selectable speeds of 300, 600, 1200, 2400, 4800, 9600, and 19200 bits per second at a minimum.

3.4.3 Telecommunications

The required centralized braille book distribution system must be accessible to internal and external users for voice and data communications. Internal users are defined as staff personnel at the primary facility, while external users are the patrons, who are provided direct access to the system under Options A and B, regional library reader advisors, staff at the secondary site, and NLS. Internal users would access the system through the LAN, while external users would access the system through a wide area network, or over 800 lines using touch-tone telephone entry for the interactive voice response feature. Furthermore, each regional library would be able to have several users connected to the central site simultaneously.

Data

Data communications between the primary and secondary sites is required. A minimum of two inter-site communication sessions per day would be required to exchange data. Under all options, data communications needs would require using the services of a packet-switched Wide Area Network (WAN), e.g. Telenet/Sprint. For this purpose, a high-speed feed from the WAN to the primary facility is provided, and a node address identifying the facility for routing purposes is assigned.

Data communications over the WAN would be achieved through an extensive network of locally accessed telephone numbers. By using modems and dialing the local access to the WAN, regional libraries would access the primary ADP system, and the primary and secondary facilities would exchange data. Any additional user support interface connectivity required at the network library level, e.g. a Windows-compatible, front-end user interface, would have to be developed by the network libraries that require such a capability. In the event that the WAN would experience a temporary failure, a contingency feature would be required whereby external users could gain direct access to the primary system via a 2400 BAUD modem by-passing the WAN.

Voice, FAX and IVR

The voice, FAX and IVR communications configuration, shown in Appendix 3-7, would consist of 4 separate telephone numbers and a 10 X 24 Key System telephone switch. Two of the 4 telephone lines would be 7 digit numbers, and 2 would be 800 lines. One of the 7 digit numbers would be used for general voice communications. This line would enter into the telephone company Central Office (CO) and be processed to the primary site as 2 separate lines/ trunks. These 2 lines/trunks would go through the Key System switch and provide calls to 3 stations; management, ADP staff and floor operations. The second 7 digit number would be required to support the FAX machine, and this line would come through the CO directly to the primary site by-passing the telephone Key System switch.

One of the two 800 lines shown would be used to support patron toll-free voice access. This line would pass through the CO and be linked with the second 800 line, both being converted to a total of 8 lines/trunks, and would then go through the Key System and be split. The reader advisors/clerks would have 6 stations. The second 800 line would be required to support the Interactive Voice Response (IVR) system. It would follow the same course as the reader advisor line, and would support 2 stations. This 800 line configuration would permit 8 patron calls to be processed simultaneously.

The 10 X 24 Key System would be a telephone switching unit capable of handling 10 lines/trunks and 24 stations. The Key System could be expanded to the next higher level, i.e., 16 lines/trunks and 40 stations, or reduced to 4 lines/trunks and 8 stations. As indicated above, all 10 lines entering the switch would be committed to specific stations, and the reason for this arrangement is to maximize the use of available lines/trunks in relationship to the anticipated types of telephone traffic.

The Auto-attendant would be used to process calls when all lines are busy, and permit the caller to select the IVR feature or an RA by use of a touch-tone telephone option (no selection by the caller would default the call to an RA). During after-hour operations, the RA telephones

would be answered by an answering machine, and the IVR would be available 24 hours a day, 7 days a week.

The secondary site would require 2 direct lines i.e., both 7 digit numbers. One of the lines would be used for a FAX machine, and the second line would be used by the site management/staff for general voice communications.

3.4.4 Electrical Requirements

All information system equipment must operate from a commercially available, unconditioned power source of nominal 120 and/or 220 VAC at a frequency of 60 Hertz. Source voltage tolerances must be within the range set by industry standards, but extended operation beyond these tolerance limits would be possible by using a power backup capability.

Transient Voltage Surge Suppressor

A Transient Voltage Surge Suppressor (TVSS) capability is required to protect all information system components from failure and damage caused by electrical circuit transient voltage spikes, surges, and line noises. This requirement may be an integrated feature of the power backup facility or a separately configured item(s). The unit must respond to, and limit, all transient voltages in excess of that which would cause damage to the protected equipment, and additionally eliminate both common mode and normal mode line noises. The TVSS device(s) are required to have visual indicators that monitor proper functioning of the protective circuits and the on/off status of the device.

Power Backup

In order to protect against database corruption, i.e., the loss of data caused by power source dropout or under voltage conditions, the information system equipment at both the primary and secondary facilities will require a power backup capability. This capability must provide for continued operation of the system components to ensure an orderly shutdown during source

dropout or under voltage conditions. A minimum period of 10 minutes of operation supporting a maximum equipment configuration is required. The maximum equipment configuration includes processor units, memory and storage devices, keyboards, monitors, scanners, modems, and auxiliary boards (power backup of printers is not a requirement).

The power backup device(s) may be either internal or external to the supported system, but must be separately ordered and configured. During the transition from and return to commercial power, no noticeable change in operations, or loss of data, should be experienced by a system component. The minimum response by the power backup unit being activated due to power loss or dropout is an audible indicator made to sound until reset by a return to commercial power or other positive action. The power backup unit(s) must be designed to operate without environmental considerations such that, in the event internal batteries are used, the unit must recharge the batteries during normal operations and not vent corrosive or explosive gases.

3.4.5 Failure Contingencies

The proposed system consists of three distributed databases residing on separate computers: a single network database server, and an inventory database server at each facility. The single database server, resident on the primary system, would maintain the database of patron data and book title and other descriptive information. The inventory servers would maintain the inventory databases of item and location information for each site. The primary danger to the system would be in the form of a total electrical failure; short of a catastrophic event, the system would be relatively secure. Any system is somewhat vulnerable to system crashes or other events that cause a sudden and total loss of data, but the requirements specified herein will minimize the impact of these possibilities.

System

Because the primary database would reside in a fault-tolerant environment with no single failure points, the possibility of system downtime due to component failure is very small. A rigorously followed schedule of data backups to preserve the primary database, and recording the

database changes in mirror image, will provide nearly 100% security to all primary system data storage. Independent backups and transaction journaling would provide recovery and backup security for the two inventory databases.

Hardware

The primary database server is a totally redundant configuration without a single failure point. If one component fails, the other one would assume the workload thus providing a very high probability that the total system would never fail. In practice, this method is very reliable.

A duplicate configuration of the inventory servers is also a requirement so that, in the event of an inventory server failure, the backup user node can be used to reload the database and journaled transactions. Functions normally performed on the user node would cease in this instance and the inventory functions would resume.

3.5 OFF-THE-SHELF VERSUS CUSTOM SOFTWARE

For the purposes of this study, off-the-shelf software is defined as any software application that is currently available and being marketed. Library applications software that was in development or in the designing stage during the course of Study I, Part 1 was not considered. Custom software is defined as a computer program developed exclusively for a specific application.

3.5.1 Off-the-Shelf Software

During the course of this study, six software packages were examined. These packages were; Data Research Associates (DRA), READS, the Keystone Library Automation System (KLAS), the Pennsylvania/New Jersey (Regional Library Consortium), the Texas Regional Library System and the Utah Regional Library System. The Texas and Utah systems were in the process of undergoing design and development changes, and for this reason, these two applications were not considered. The analysis performed on the four remaining software

packages was limited to the information made available by the vendors or in-house designers, or lack thereof. Of the three vendor packages reviewed, only the DRA and READS systems were afforded the opportunity for hands-on testing/review by the study team. Information on the Penn-Jersey system was provided by the Carnegie Library of Pittsburgh, but a hands-on review was not possible because this regional library was not one of the visited sites.

Each software package was examined to determine what functions and capabilities it possessed and how flexible the program was based on its design and structure. Each program was also probed to determine how closely the application matched the centralized braille system requirements contained in this report. While each of the software packages performs the required functions to distribute braille books through the NLS network, each of these applications also accomplishes many more functions than required, i.e. options for different types of media, tracking of machines, etc.

Although every package supports some form of bar coding or OCR scanning, no one system is configured to support random storage of the entire collection. However, several of the packages do perform the "quick turnaround" function, which could be expanded to accommodate random storage for the entire collection.

In examining the operating platforms for which these programs were designed, some were built using a hierarchical approach (DRA, READS and Penn/Jersey), while one uses a relational approach (KLAS). The hierarchical approach eliminates the need for referencing many data tables, which in turn increases program performance, while the relational approach is devised using a module technique, which allows the developer to select only those modules required to perform the needed operations. As previously indicated, none of these software packages can support all the requirements outlined in this report without some degree of modification. In addition, the use of off-the-shelf software does create a dependence on proprietary software.

3.5.2 Custom Software

Custom software is specifically developed for a particular application. The advantage to custom software is that it is designed to perform only those functions which are required. Issues to be concerned with vis-a-vis custom software development are; 1) time expended in development, which could slow down the overall implementation, 2) modifications to the system as it grows, 3) adding requirements in the future which may currently exist in off-the-shelf software, and 4) the expense associated with development. However, custom software can be developed in a fashion which eliminates proprietary software rights and can be supported by in-house staff for maintenance and modification.

3.6 STAFFING REQUIREMENTS

The staffing requirements in support of the proposed automated system are relatively limited. The primary system is the only computer system within this application that would require full-time ADP staff, and would require two people. These personnel would have to be familiar with systems hardware maintenance, network management and database administration.

Personnel supporting the subsystems at each site would have to be computer literate, but not highly versed in the detailed workings of databases and networks. One person would be responsible for each subsystem, but not on full-time basis. These personnel would perform other duties at the centers, and one other individual at each site would have to be designated as an alternate to back-up the primary position.

3.7 SPACE REQUIREMENTS

The facility space requirements enumerated herein pertain only to the area required to house the personnel and equipment supporting the primary system, and all other space requirements are detailed in Section 4. Floor space would be needed to accommodate the computer processor, dual monitors, backup tape drive, disk storage drives, high speed printer and

two personnel. This configuration would require approximately 384 square feet of office space, and space requirements would be the same regardless of the option being implemented.

3.8 ESTIMATED COSTS

Costs included in this section are considered to be estimates, and may change somewhat depending upon the results of the specifications phase. Automated systems costs are detailed in the following three categories; computer/peripheral hardware, software and telecommunications, and each cost is further segmented by option.

3.8.1 Hardware Costs

Cost data provided under this header includes all hardware and peripherals associated with the primary system and two subsystems (Ref. Appendix 3-3). The expenditures pertaining to the primary system include one fault tolerance dual processor, 8 dumb terminals for the Systems Administrator and Reader Advisors (under Option A) and two terminals for systems maintenance under Options B and C. Also priced is a system printer, tape backup drive, backup power supply, annual maintenance and installation, all of which apply to all options.

Every item priced for the subsystems is identical across the board for each option. The subsystem server is priced as a 486DX microprocessor, and the subsystem workstation is expensed as a 486 microprocessor, which would also provide backup support to the subsystem server. Also included in the pricing is a backup power supply. The bar code hardware costs include hand-held scanners, transceivers, computer interfaces, and scanner cradles, and costs associated with maintenance to support this hardware were consolidated.

3.8.2 Software Costs

This section pertains to software and the associated maintenance, installation and training costs for the primary system and subsystems (Ref. Appendix 3-4). The primary software category was divided into 4 areas; costs for the operating system and application programs, costs

for custom software development, expenditures connected to developing the IVR software, and expenses associated with software to support the bar code application.

The system software costs include amounts for the operating system, system maintenance utilities, word processing and spreadsheet applications. The application programs are priced as network version. The custom software development costs are priced based upon a 3 man-year effort at $55,000 per man-year. The Direct Access software involves costs affiliated with the source code used to operate the Interactive Audio Voice Response function. The bar code costs cover the expenses to develop an interface between the bar code scanners, the subsystem servers and the primary system; the maintenance and installation costs for the bar code software are an aggregate value for this software. Maintenance costs are portrayed as an annual estimate, and training is priced as on-site and pertains to all of the software where appropriate.

For Options A, B and C, the costs to regional libraries would be limited to those libraries needing to connect with the primary system and/or have direct access to braille database utilities. These costs would be completely discretionary for the libraries under Option A, but some investment would be mandatory under Options B and C, the extent of which must be determined by, and is a function of, the existing configurations of local ADP systems. The libraries would experience a $6.00 per hour cost to be connected through the Wide Area Network (WAN).

3.8.3 Telecommunication Costs

Telecommunication costs have been divided into one-time costs and recurring costs (Ref. Appendix 3-5). The one-time costs are associated with the purchase of communications hardware, software and installation. The recurring costs represent expenses involving telecommunication traffic between the primary and secondary sites, and anticipated activity from regional libraries and patrons.

The one-time costs encompass both the primary and secondary sites. The communication hardware cost includes expenditures for the telephone Key System switch unit including all related peripheral such as telephone units, cabling, line interface cards, etc. The auto-attendant

costs are associated with the equipment itself, and programming of the equipment. The network software expenditure is related to the communication software required to operate the primary and secondary LANs. Two FAX machines are also listed, and one each would be used at the primary and secondary sites. The installation costs are an aggregate for implementing all the utilities addressed above.

The recurring costs take into account both the primary and secondary sites, even though the secondary site would incur very little costs; the majority of the telecommunication costs would be borne by the primary site. There would be expenses for two (800) communications lines, and this line cost applies to Options A and B to cover calls to the reader advisors at the center in Option A (Ref. Appendix 3-6), and clerks in Option B, and for Direct Access (IVR) in Options A and B. There would also be costs for 7-digit number lines, which would support management/administration at both sites, and provide for a FAX machine at each location. A communications net is also priced to provide a data communications link between external users and the primary center.

SECTION 4

FACILITY, STAFFING AND OPERATIONS REQUIREMENTS

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Section 4

FACILITY, STAFFING AND OPERATIONS REQUIREMENTS

This section of the Study I, Part 1 report presents our findings, conclusions, and recommendations for the non-automation-related requirements for a centralized braille book service. The options presented for facilities, staffing, and operations are clearly shown to be compatible with automation Options A, B, and C, as delineated in Section 3. Information support requirements for all options are identical unless otherwise specified.

4.1 STORAGE AND THROUGHPUT REQUIREMENTS

The collections to be housed in each distribution center, the allocation of patrons between the two facilities, and the resultant copies and volumes to be received, stored and shipped were presented in Section 2. These pro forma facility design parameters are summarized in Exhibit 4-A below. Analyses were conducted to develop building size, configuration and storage equipment to accommodate these requirements.

Exhibit 4-A

STORAGE AND THROUGHPUT DESIGN PARAMETERS			
Distribution Center	Storage	Receiving and Shipping	
	Lineal Feet of Shelving	Volumes Per Day	P.O. Hampers Per Day
Eastern	153,220	1270	22
Western	103,312	634	11
Total	256,532	1904	33

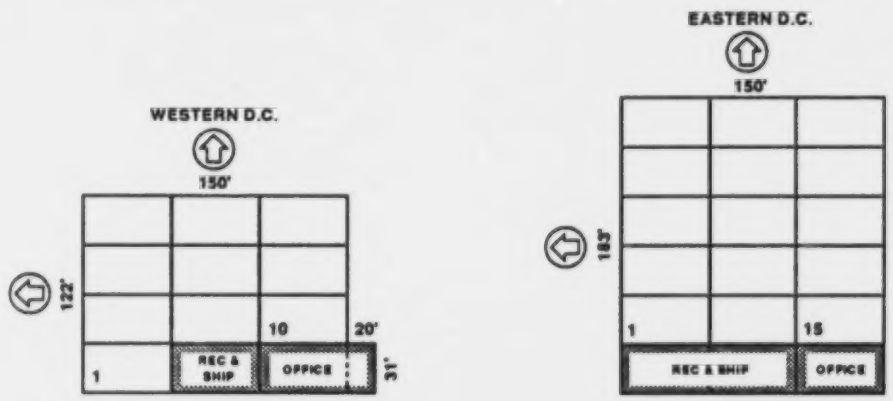
4.2 BUILDING CONFIGURATIONS

The proposed building configurations for the Eastern and Western Distribution Centers (DCs) are depicted in Exhibit 4-B, and detailed layout drawings of the two facilities may be

found at the end of the appendices. As can be readily seen, the orientation of functions within the two facilities is identical, and their only substantial difference is size. The Eastern DC has an area of 27,450 square feet and the Western DC has an area of 18,920 square feet under Option A, and 18,300 square feet under Options B and C.

Exhibit 4-B

PROPOSED BUILDING CONFIGURATIONS AND SPACE ALLOCATIONS FOR CONSOLIDATED BRAILLE DISTRIBUTION CENTERS



OPTION A	OPTION B & C		OPTION A,B & C
15,250 ϕ	15,250 ϕ	STORAGE AREAS	22,800 ϕ
1,530	1,530	NON-STORAGE AREAS	3,130
2,140	1,520	OFFICE AREAS	1,520
18,920 ϕ	18,300 ϕ	TOTAL AREA	27,450 ϕ

The DC's will be modern, free-standing structures specifically tailored to their appointed use. Design, materials and workmanship will be first class in every respect, in full conformance with all building codes, and in harmony with the Occupational Safety and Health Act (OSHA) and the Americans with Disabilities Act (ADA). Temperature, humidity and dust controls and epoxy coated floors will provide a stabilized storage environment for braille books and a

favorable working environment for personnel. Lighting levels and provisions for fire protection will meet or exceed ALA standards.

4.2.1 Storage and Non-storage Areas

The storage and non-storage space allocations are identical for all options, except for the office areas. The storage areas in the Eastern DC will provide 50% more storage capacity than those of the Western DC, and the non-storage areas of the Eastern DC will accommodate 100% more throughput than those of the Western DC.

4.2.2 Office Areas

In sizing the office areas, it was assumed that the primary ADP system will be located in the Western DC (contingent upon several transition related issues). Space for reader advisors is required only under Option A; therefore, the reader advisors, if required, would also be located in the Western DC. Other than these two exceptions, the office space allocations for all options will be identical.

The office areas include common restrooms and a common lunch room for all personnel, and all workers will enter and exit the DC through the front door. A vestibule and reception window is provided for identifying all visitors, and one or more designated individuals will always be in attendance. Space has been provided in the DC manager's office for accommodating all visitors, and the DC manager will conduct all tours of the facility.

4.2.3 Provision for Expansion

Each of the distribution centers is configured to permit modular expansion in two directions with minimum disruption to ongoing operations. Expansion to the rear will provide additional storage capacity for braille books, while expansion to the side will accommodate other conceivable, compatible logistics functions, such as audio machine storage, distribution, and repair. The office areas can also be expanded in two directions, if necessary.

4.3 FACILITY OPERATING SCHEDULES

The proposed facility operating schedules provide a same-day shipping response for all shippable patron requests that are entered during normal working hours in the time zones served by each distribution center. The proposed schedules for Option A are presented in Exhibit 4-C, and further discussed below; the schedules are the same for Options B and C except as noted.

Exhibit 4-C

PROPOSED FACILITY OPERATING SCHEDULES AUTOMATION OPTION A			
Location Code[A]	Activity	Local Time At	
		Eastern DC	Western DC
O	Answer inquiries and enter shipping requests	- -	6:00AM - 6:00PM
F	Unload post office deliveries	10:00AM - 10:10AM	10:00AM - 10:10AM
F	Unpack and shelve books	10:10AM - 12:30PM	10:10AM - 12:30PM
F	Enter receipts in inventory record	12:30PM - 1:00PM	12:30PM - 1:00PM
F/O	Lunch break	Floating	Floating
O	Screen patron requests and print pick tickets (40%)	1:00PM - 1:30PM	1:00PM - 1:30PM
F	Fill orders for patron requests	2:00PM - 4:00PM	2:00PM - 4:00PM
O	Run Profile Select and print pick tickets (55%)	2:00PM - 4:00PM	2:00PM - 4:00PM
F	Fill orders for Profile Select	4:00PM - 6:00PM	4:00PM - 6:00PM
O	Run late orders, transfers and closeouts (5%)	6:00PM - 6:05PM	6:00PM - 6:05PM
F	Fill late orders, transfers and closeouts	6:05PM - 6:20PM	6:05PM - 6:20PM
F	Load post office pickups	6:20PM - 6:30PM	6:20PM - 6:30PM
Note [A] - O = Office Operations; F = Floor Operations			

4.3.1 Reader Advisor and Order Clerk Schedules

As previously noted, reader advisors are required only under Option A. With all reader advisors located in the Western DC, some advisors will begin work at 6:00AM Mountain Time to service patrons in the Eastern Time Zone, and others will start later in the morning and continue working until 6:00PM Mountain Time to service patrons in the Pacific Time Zone. This schedule will allow patron access from 8:00AM to 5:00PM in all time zones. This schedule also holds for order clerks in Option B.

Because of the extended patron coverage, there will be no fixed time for lunch breaks for either the reader advisors or the order clerks under Options A and B, respectively.

4.3.2 Receiving, Stocking, and Fulfillment Schedules

There will be a 2-hour time differential between the Eastern and Western distribution centers, but local time schedules will be identical for all options. Normal working hours in the Eastern DC will be 10:00AM to 6:30PM Eastern Time, and in the Western DC will be 10:00AM to 6:30PM Mountain Time. All receiving, stocking and rewarehousing functions, including entries to the inventory record, will be completed before 1:00PM. All order filling, packing and shipping functions, including confirmation of open shipping tasks, will be initiated and completed after 2:00PM.

4.3.3 Pick Ticket Print Run Schedules

There will be three pick ticket print runs for each distribution center under Option A, and the timing of the runs will be keyed to the local times at the distribution centers. The first filling run will be for patron requests to be filled by the Eastern DC, and will be made from 1:00PM to 1:30PM Eastern Time. The second batch of pick tickets is for Profile Select, and the filling run is made while the first batch of pick tickets is being picked and packed. The third batch of pick tickets is for late requests, transfers and closeouts, and is made at a designated cutoff time near the end of the workday.

There will be no Profile Select at the centers under Options B and C (the batch transmitted orders from each RL will be rolled up into the order filling cycle for direct patron requests), and therefore only two order filling runs per day for each distribution center will be applicable.

4.3.4 Post Office Delivery and Pickup Schedules

Early morning delivery of patron returns and early evening pickup of shipments to patrons have been cleared with the local postal authorities, and assurance has been received that all pickups will be processed through the local USPS bulk mail facility and will be loaded out the same evening. It is furthermore estimated that the additional, incremental transit time that would be incurred as the result of braille centralization will generally be no more than two full days in the envisioned configuration.

4.3.5 Response Time Comparison

The proposed facility operating schedules make the morning's receipts available for same-day shipment in the afternoon, thus providing earlier access to popular titles, while ensuring a same-day shipping response on all newly received shippable patron requests. During our site visits, we found that P.O. pickups were made the second morning following order entry at two regional libraries, and on the third morning following order entry at a third regional library. Therefore, based upon observed operations at the visited sites, present turnaround times will be potentially reduced by two full days under the proposed facility operating schedules, thus virtually compensating for any potential increase in postal transit times. It is noted here that some network libraries may currently execute order turnaround more quickly, or more slowly, than is true for the visited sites.

4.4 BAR CODING OF VOLUMES

The NLS and several libraries have considered plans to bar code each volume of braille with a unique machine-readable and human-readable identification number. It is recommended

that the bar code label be placed on the spine of a volume, so as to be readily visible for scanning at all times but must necessarily be placed on the front or back cover of volumes that are stapled or ring-bound. A duplicate label should also be placed on the inside of the front cover, as a backup in case the spine affixed label becomes detached or unreadable.

The NLS has also initiated plans to adopt a canvas pouch shipping container that will hold only one full-size braille volume. A volume, rather than a book, will accordingly be the unit of receipt, storage and issue in the new distribution centers. Because of these formative NLS plans, as well as the USPS plan for automated sorting discussed in Section 2.9, and because the technology is a proven vehicle for improving accuracy and control, bar coding is a most important facility and systems design parameter. We have accordingly strived to exploit its full potential in the operational design of the distribution centers.

4.5 STORAGE MODE

The storage function occupies over 80% of all space in the new distribution centers. Defining the storage requirement, weeding the collections (which will later be done when a circulation history by title has been compiled), and selecting the most space efficient storage methodology are therefore critical to project economics. The proposed layout of the storage area in the Western DC is shown on Drawing No. 212-D-1833A, and the proposed storage layout of the Eastern DC is shown on Drawing No. 212-D-1834A, both of which are folded blueline drawings enclosed in the clear plastic envelope immediately following the appendices.

4.5.1 Bar Coding of Shelf Locations

ManTech proposes that every shelf location in the storage area be bar coded with a unique identification number, so that each volume will have a machine-readable and human-readable storage location. The bar code label will be positioned on the front lip of each shelf, so as to be readily visible for scanning. There will be one location number per 3-foot wide shelf, and all volumes in a shelf opening will have the same location number.

The locator record is an adjunct of the inventory record, and the computer will be programmed to reject any inventory entry that does not have an accompanying storage location. This built-in safeguard will insure that all volumes on premises are always accounted for.

4.5.2 Stock Locator Numbering System

The proposed shelf numbering system consists of an alpha character to designate the storage module location and four numeric characters to designate the shelf opening. There are 3,450 shelf openings in a typical storage module. The first and last shelf number in a storage aisle will be prominently displayed on the end panels of each shelf row.

The shelf openings are numbered by aisle, bin section and tier, in a grid pattern that will enable workers to readily locate stock, and the pick tickets in an order filling run will be printed in optimum picking sequence. This will greatly reduce travel and search time, thus enhancing picking accuracy, productivity and service effectiveness.

4.5.3 Random Storage

The bar coding of volumes and shelf locations also permits the individual volumes to be randomly stored, rather than stored in title number sequence, as is now common practice. This state-of-the-art storage technique requires no pioneering, and will increase storage density in the new distribution centers by 20%. Shelving costs, construction or lease costs and occupancy costs will accordingly be reduced by 20%; this savings will be even greater, on a percentage basis, after any weeding of the BR collection.

The capacity improvement potential of random storage was confirmed by sampling 13.2% of the braille collection in the Utah State Library, where volumes are stored in strict title number sequence. The results of this sampling are detailed in Appendix 4-1 and summarized in Exhibit 4-D below, together with the pro forma increase in storage capacity.

Exhibit 4-D

CAPACITY IMPROVEMENT POTENTIAL WITH RANDOM STORAGE UTAH STATE LIBRARY BRAILLE COLLECTION						
	Present			Pro Forma		
Shelf Status	Number of Shelves	Volumes Stored	Average Volumes Per Shelf	Number of Shelves	Volumes Stored	Average Volumes Per Shelf
Full	335	4161	12.42	335	4161	12.42
Partial	659	5842	8.86	687	7843	11.42
Empty	28	-	-	-	-	-
Composite	1022	10003	9.79	1022	12004	11.75
Capacity Improvement Potential					+20%	

As noted in Exhibit 4-D, the composite (weighted average of full and partial shelves) storage capacity of a 3-foot wide shelf opening will be 11.75 volumes with random storage, while the capacity of a full shelf is 12.42 volumes. A working vacancy allowance of 5.7% was therefore provided in calculating the capacity improvement potential of random storage.

4.5.4 Storage Zones

Random storage permits any volume to be stored in any available storage location. However, we suggest that the storage areas be zoned by collection, and possibly by date of publication, both being simple measures of comparative activity. For example, the BRJ collection would be separate from the BR collection, and all BR numbers from 4000 to 5000 could be stored in the same zone. Within each zone, the volumes will be randomly stored.

4.5.5 Mobile Shelving

We propose that powered mobile shelving be used for the storage of all braille books. Shelving details and the proposed mobile shelving module configuration are provided on the layout drawing of the Western DC, which should be opened for reference.

Mobile Shelving Module Size

A storage module of mobile shelving, including end aisles, will occupy an area of 30 feet x 50 feet. A storage module will consist of 11 mobile shelf ranges that roll on rails imbedded in the floor, one fixed shelf range, and one 3'-9" wide moveable aisle. Each range consists of 14 back-to-back cantilever shelf sections 3 feet wide x 10 shelves high.

Including the shelf sections located on the end aisles along the building walls, the average storage module will have 10,230 lineal feet of usable shelf frontage, providing an effective storage capacity of 40,000 braille volumes. Storage density will therefore be 26.7 volumes per square foot. Ten storage modules will be required in the Western DC and 15 storage modules will be required in the Eastern DC.

Mobile Shelving Economics

In addition to providing the NLS with a state-of-the-art braille storage system, a mobile shelving installation is also somewhat more economical than a fixed shelving installation. The comparative cost of one module of mobile shelving and a module of fixed shelving with the same storage capacity is presented in Exhibit 4-E below.

Exhibit 4-E

COMPARATIVE COSTS OF FIXED AND MOBILE SHELVING			
Cost Element	Cost Per Module		
	Fixed Shelving	Mobile Shelving	Cost Differential
First Costs			
Site and construction @ $37/sq. ft.	$129,500	$55,500	$74,000
Shelving, delivered and installed	87,000	160,000	(73,000)
Total First Costs	$216,500	$215,500	$1,000
Occupancy Costs @ $1.85/sq. ft. Per Year	$6,475	$2,775	$3,700

A total of 25 mobile shelving modules is required in the two centers. Although the mobile shelving itself costs almost twice (1.84 times) that of equivalent capacity fixed shelving, its storage density is more than twice (2.33 times) that of fixed shelving. First costs will therefore be reduced by $25,000 with mobile shelving, but occupancy costs will be reduced by $92,500 per year. The potential reduction in occupancy costs is equivalent to the annual labor cost of almost four workers in the distribution functions. Although the above example assumes the building and mobile shelving are purchased, the same logic applies if they are leased.

Module Lighting

The lighting fixtures in a mobile storage module will be ceiling mounted, and the minimum clearance below fixtures will be 13'-0". Each module will be independently wired, and the lights will be turned on or off at a control panel located on the end panel of the fixed shelf range. The modules will not be lighted except when in use.

Shelving Details

Elevation views on the layout drawing of the Western DC provide further details of the proposed shelving configuration. The shelving is of cantilever design, and the shelves in each back-to-back section have a common upright. Usable shelf depth is 12" and usable shelf width

is 35½". The shelves have a load rating of 50 pounds per square foot, which is the A.L.A. standard.

The shelf assemblies are hung on the shelf uprights, rather than bolted, and shelf elevations are readily adjustable in 1" increments. This feature will be useful in profiling the shelves for the book sizes of some collections. The normal shelf spacing will be on 12" centers, providing a clear shelf opening of 11¼" for volumes 11" high.

The most active titles will be stored on the seven lower shelf levels. The least active and dormant titles, and the BRA Master collection, will be stored on the three upper shelf levels. The upper tiers will be accessed by ladder cart. To stratify the collections, the activity of individual titles will be tracked by computer, and relocation and/or weeding instructions will be issued on request.

4.6 RECEIVING MODE

There will be common receiving and shipping areas under the contemplated mode of operation, but the two functions will always be performed at different times of day. The receiving/shipping area in the Eastern DC will be twice as large as the area in the Western DC, to provide for 100% more throughput, but their operating modes will be identical. The layout of the receiving/shipping area in the Western DC will be referenced during the discussion.

4.6.1 Receiving Layout

The receiving area in the Western DC will be 50 feet wide x 31 feet deep. There will be one tailgate height truck spot equipped with a built-in mechanical dock board, and a bulk storage area of 300 square feet for pouches, forms and other supplies. A pedestrian door will be provided for driver access, and the door will normally be locked.

The staging area is sized to accommodate 14 P.O. hampers for normal receiving activity, and 28 P.O. hampers for peak activity. The capacity of a full hamper is 80 volumes. The

staging area can also be used for staging pallet cages, if the local postal authorities desire to have some or all patron shipments presorted by destination. The capacity of a full pallet cage is 160 volumes.

There will be two workstations for opening and recording receipts, each equipped with a work table 14 feet long x 4 feet deep. The work tables will have a slick top and a shelf compartment below for temporary storage of empty pouches. At the rear of the work tables will be forward ("quick turn") shelving for transient storage of incoming volumes, and each workstation can store up to 700 volumes. The shelving is of the same design as the fixed shelving in the mobile storage modules, and the shelf locations will be similarly bar coded.

All volumes entering the facility will be placed in the forward shelves and all inventory entries will be made while the volumes are shelved. Receipts will be recorded at the work stations by the use of Integrated Portable Scanning Devices (bar code scanners) using Radio Frequency Data Communication (RFDC) capabilities. The scanners will also be utilized for data entry when performing shipping and stocking tasks.

4.6.2 Transaction Types

The proposed receiving methodology is designed to accommodate single-volume or multi-volume receipts from all sources, and for volumes that are bar coded and those that are not. Volumes that are not bar coded will not be in the inventory record at the time of receipt, and a much more time-consuming documentation procedure will be required to enter such receipts.

4.6.3 Patron Returns - Bar Coded

The contents of incoming hampers will be mixed as received, and must be sorted by transaction type. The canvas pouches or other containers will therefore first be opened and inspected at the receiving work stations, and the bar coded volumes will be immediately shelved. The return address cards for bar coded volumes will be removed from the emptied canvas pouches and examined for any messages that may have been annotated by the patron. These

cards will be turned in to the office and cards with no annotations will be discarded. The empty pouches will then be set aside for reuse as shipping containers the same day.

When all incoming bar coded volumes have been shelved for the day, all of the volumes in each forward shelf opening and their shelf location will be scanned. This scanning will simultaneously change the inventory record, enter the shelf location of each volume, update the Has Now patron file for Options A, B, and C, and update the Has Had patron file for Option A.

4.6.4 Patron Returns - Not Bar Coded

Patron returns that are not bar coded will be shelved separately from those that are, together with address labels or other papers that may identify the sender. Receiving personnel will initially check to ensure that each non-bar coded volume is not the property of a non-participating library; if it is, the volume will be mailed to the correct destination. Each volume will then be individually bar coded and its BR number and volume number keyed into the scanner. The bar code number on the volume and the shelf location will then be scanned. This simultaneously changes the inventory record and enters the shelf location of each volume. If any mailing cards have notes or messages on them, they will be forwarded to reader advisors or clerical staff in the office area.

Immediately following this keying and scanning, the patron number/name will be keyed into the scanner, and the bar code on the volume will be scanned again. This second keying and scanning updates the Has Now patron file for Options A, B, and C, and the Has Had patron file for Option A.

4.6.5 Other Receipts - Bar Coded

There will be occasional transfers between distribution centers, returns of damaged books and library loans, and similar transactions. A record of these volumes and their whereabouts will be in the database, and scanning of the bar codes on the volumes and the forward shelf locations will update the files in the same manner as for bar coded returns from patrons.

4.6.6 Other Receipts - Not Bar Coded

This transaction type includes transfers from regional libraries prior and subsequent to startup, and titles or collections from other sources. It is also assumed that all new titles from printer/binders will be shipped directly to the distribution centers for bar coding and entry into the inventory record. The receiving procedure for these receipts that are not bar coded is identical to that of patron receipts that are not bar coded, except that no entries are required to update the patron files.

4.7 ORDER FILLING AND SHIPPING MODE

The proposed order filling and shipping methodology is designed to accommodate single-volume and multi-volume shipments to all destinations, and all volumes so shipped will be bar coded. It is estimated that approximately 60% of the days shipping requirement will be filled from the forward shelves in the receiving area, and 40% will be filled from the stacks.

4.7.1 Shipping Priorities

Patron requests which are title specific represent 45% of shipping demand in the regional libraries. Profile Select, which is triggered by title availability, reader history and reader interest, represents the remaining 55%. Present practice is to give preference to patron requests, and most libraries have established a higher priority called "must have," or "Reserve", for special situations. "Turnaround Service", which is triggered by a patron return, can be filled as either reserves, requests, or by profile select.

Shipping priorities are not a critical design parameter, and can be made by any decision rules desired. However, once these priorities are set, we suggest that only a few selected individuals be authorized to intervene, and that such interventions be fully documented.

Reserves will have first call on available books, requests will have second priority, and Profile Select will have third preference under all options. We propose that backorders be queued by date and time of entry under all options.

We also recommend that the reserves and requests of patrons assigned to a distribution center have first call on available books, and that the reserves and requests of patrons not assigned to a distribution center not be backordered. However, if one distribution center is the sole source for a title, then all patrons should have equal access. The system will make these "entry" or "no entry" decisions under all options.

4.7.2 Non-Shippable Inventory

The inventory record will be flagged to reject requests for copies from the BRA Master collection. The computer will also be programmed to reject the shipment of a single volume of a multi-volume title unless a manual override has been executed to facilitate this.

4.7.3 Picking/Stocking Carts

We propose that shelf-type 4-wheel hand carts be used in the stack areas for both picking and stocking. The cart shelves will be 4-high and of the same cantilever design as the shelving in the storage modules. Each cart shelf will be bar coded, but this feature will be utilized only in the stocking processes. The capacity of a full picking/stocking cart will be 100 volumes.

4.7.4 Pick Tickets

The proposed picking document is the single copy combination pick ticket/address card described in Section 3 and depicted in Appendix 3-8. There will be one pick ticket for each volume. The tickets will be serially numbered when printed, beginning with the number 0001 each day, and will be numbered and printed in strict shelf location sequence. The tickets will be left in continuous strip form during the picking process, and will be later separated when the individual orders are packed.

4.7.5 Picking and Packing from the Forward Shelves

Picking and packing will be combined in the forward shelf area, and a picking/packing task assignment will be all the volumes in one shelf section. All volumes in one batch assignment must be picked, packed and their shipment confirmed by the same individual, and all irregularities must be reconciled before the next task assignment is begun.

The picker/packer will first remove a string of pick tickets from the print run and proceed to the designated forward shelf area. They will then pick the first designated volume and place it in a canvas shipping pouch. The pick ticket will then be removed from the string of tickets and placed in the window of the pouch to serve as an address card. The bar code on the volume and the transaction bar code on the address card will then be scanned. This scanning confirms shipment of the request, relieves the inventory record, clears the locator record, and updates the patron Has Now file for all options. If the two bar codes are mismatched, the picker/packer should be alerted by the system, and no further action should be possible until the error is corrected. The pouch will then be closed and placed in a shipping hamper.

The picking/packing/scanning sequence will be repeated until all volumes in a batch have been processed. The picker/packer will then query the computer to verify that all shipping transactions in the batch have been completed.

4.7.6 Picking and Packing from the Stacks

A picking/packing task assignment in the stack area will be 100 volumes, which is the capacity of a full picking cart. The picker/packer will first remove a string of 100 pick tickets from the print run, and then proceed to the first designated storage module and turn on the lights. The designated storage aisle will then be opened, the picker will pick the first designated volume and place it on a cart shelf. Subsequent volumes will be picked and placed on the cart shelves in strict pick ticket sequence.

On completion, the picker will take the full cart and the string of pick tickets to the packing area, and proceed to pack the volumes and confirm their shipment in the same manner as for volumes picked from the forward shelves.

4.8 STOCKING MODE

Stocking activity will consist of transferring volumes from the forward shelf area to the stacks, and relocating volumes within the stacks. These functions will always be performed in the morning hours, so that all new storage locations are in the database before the order filling runs for the day are begun. Picking/stocking carts will be used in making all stock transfers, and a full cartload will constitute a stocking task assignment.

4.8.1 Stocking from the Forward Shelves

With an estimated 60% of the shipping requirement coming from the forward shelves, 40% of all receipts must later be transferred to the stacks, but not necessarily the same day. The forward shelving in the new distribution centers is sized to accommodate one full day's receipts plus 3 day's carryover, and not all forward shelves need be cleared in any one day. This provides a sizeable scheduling flexibility to help balance day-to-day variations in the workload.

To initiate a transfer, the stocker will fill a cart with volumes from the forward shelves, making sure that each shelf opening is emptied, and sorting the volumes by storage zone as they are placed on the cart. The volumes on the cart and the cart shelves will then be scanned to record the in-transit locations, and the emptied shelves in the forward area will be scanned to confirm that the stock location record has been cleared, and to account for all volumes.

The stocker will then proceed to the appropriate storage zone in the stacks and place the first volume in the first available location. The bar code on the volume and its new shelf location will be scanned to record the new location and delete the in-transit location; once a bar code on a volume has been scanned, another volume should not be able to be scanned until the shelf location bar code has been scanned. When a cart shelf is emptied, the cart shelf label will

be scanned to confirm that the stock location record has been cleared and to account for all volumes. This process will be repeated until the cart is empty.

4.8.2 Relocation of Volumes in the Stacks

The relocation of volumes in the stacks is occasioned by the wane in popularity of individual titles, and the consequent need to enlarge the storage capacity of the affected storage zones. This function will not be a frequently scheduled activity, and should properly be performed in conjunction with weeding of the collections. The procedure for relocating volumes within the stacks is identical to the procedure for transferring stock from the forward shelves.

4.9 OFFICE OPERATIONS

There are several functions which would be performed by personnel located in the office areas of the braille centers. For Options A, B, and C these include managerial, clerical and ADP functions, and for Option A there is the additional requirement for reader advisory services.

4.9.1 Reader Advisory Services

The Option A design calls for reader advisory services to be provided by the braille centers. As previously discussed in the report, it is recommended that one of the centers be a Primary Site, wherein the central ADP system would be located, and from where all reader advisor services would be provided to patrons of the free library centralized braille service.

Reader advisors at the centers would provide the same services currently rendered to patrons by the network braille libraries and would even include initial registration with the free library program for patrons from "non-participating" states. They would conduct telephone conversations with, or address mail/fax correspondence from patrons who: place specific orders; require assistance in making selections; inform the center of address changes; inform the centers of reading preference changes; request that their book quota be changed; request that service be

stopped temporarily; request that books be sent to a temporary address for a specified time period; or request to be added to, or removed from, the profile select service.

Reader advisors would also have collection maintenance responsibilities, specifically the determination of weeding requirements (after a circulation history has been established at the centers), book subject coding and the provision of input into the braille production planning process for center collection development. Therefore, it is recommended that the reader advisors possess MLS degrees. Reader advisors would have the responsibility for conducting initial, secondary and final attempts at retrieving overdue materials from patrons. Finally, walk-in and tour service should be provided at the centers and these additional functions would be performed by reader advisors, except the tours should be conducted by the center manager if he/she is available at the time of the tour. One reader advisor would also be designated as a working supervisor, who would coordinate the efforts of the other reader advisors.

4.9.2 Clerical Support Services

All three options would require clerical support services in the office operations, but the level of support required is different for each option.

- Option A - In this option, general clerical support would be provided to the reader advisors, who would have virtually all direct contact with patrons. Clerical staff would assist in processing written correspondence (outgoing correspondence and reports, and incoming orders on mailed Braille Book Review forms), patron file maintenance including initial registration of patrons from non-participating states, and general clerical support to the manager.

- Option B - This would require more staffing than in Option A because there would be no reader advisors at the centers to handle specific orders from patrons (a requirement of Option B). In this option, clerical staff would handle and process all telephone orders and status requests for specific titles from patrons who choose to contact the centers directly, rather than place orders through their

home regional libraries. Other than this, the other functions that are described in Subsection 4.9.1 for reader advisors would be performed at the network libraries, with the exception of overdue materials, which would be the responsibility of clerical staff at the centers, and the initial registration of patrons from non-participating states.

- Option C - This option will require general clerical support to the manager of each center for overall management reporting requirements and coordination with regional libraries. In this option, there is no patron contact whatsoever with the centers by telephone, mail or fax, and all orders and patron file updates and registration would be made by the regional libraries on the centers' system via a data telecommunications interface. Clerical staff at the centers would, however, have the responsibility for tracking down overdue books.

4.9.3 Managerial Services

Each of the three options would require a single overall manager for the two centers, who would be located at the primary site, and would have overall responsibility for, and authority over, the entire operation. These responsibilities will include; all personnel actions at the primary site, day-to-day management of the operations, all contact with and reporting requirements for NLS, planning for necessary capital investment enhancements, planning for anticipated workload changes, training and serving as the primary liaison with network libraries. Also, in Options B and C, it would call for the manager to assume the responsibilities for collection development (in Option A, the reader advisors would assume this responsibility). Additionally, the manager would conduct tours of the facility as his/her time permits.

The secondary site under each option would require a manager/supervisor, who would have overall responsibility for, and authority over, the secondary site's operations. The individual would also assist in day-to-day operations as required when not performing duties of a strictly supervisory nature.

4.9.4 ADP Staff

The primary site would require two individuals under each of the three options considered. The staff would consist of one systems analyst, and one systems programmer. In tandem, these individuals would have full responsibility for all aspects of ADP operations.

4.10 SPACE REQUIREMENTS AND COSTS

The pro forma building construction costs for the new distribution centers are presented in Exhibit 4-F below, and they are identical for all options except for the office area, which is downsized for Options B and C relative to Option A. The cost estimates are in 1992 dollars, and include the cost of land and site preparation in addition to the cost of construction. These estimates were obtained from the Building News General Construction 1992 Costbook, and include geographic cost modifiers for adjusting national average costs to local costs.

Exhibit 4-F

PRO FORMA BUILDING CONSTRUCTION COSTS				
	Eastern DC		Western DC	
	Warehouse	Office	Warehouse	Office
National Average Cost Per Sq. Ft. Geographic Cost Modifier	$44.00 .86	$53.00 .86	$44.00 .81	$53.00 .81
Local Cost Per Sq. Ft.	$37.84	$45.58	$35.64	$42.93
Total Area (Sq. Ft.)	25,930	1,520	16,780	2,140
Total Area Costs	$981,000	$69,000	$598,000	$92,000
Total Facility Costs	$1,050,000		$690,000	
Costs Per Square Foot	$38.25		$36.47	

The above cost estimates assume that the facilities will be built-to-order, free-standing structures, and the buildings could be either purchased outright or leased. If leased, the annual

lease costs would be approximately 10% of the first costs, or $174,000, which is also equivalent to a 30-year fixed-rate annuity of the principal at 9.3% per annum.

Annual occupancy costs would be approximately 5% of first costs, or $87,000. These costs would include all utilities, maintenance of buildings, equipment and grounds, janitorial services, security and city services.

4.11 EQUIPMENT REQUIREMENTS AND COSTS

The pro forma equipment costs for the new distribution centers for the floor operations are presented in Exhibit 4-G below, and are identical for all options. The cost estimates are in 1992 dollars, and include all equipment that will be utilized in receiving, stocking and shipping braille books, except for the cost of the bar code scanners. Bar code related costs are covered in the automation cost estimates presented in Section 3.

Exhibit 4-G

PRO FORMA EQUIPMENT COSTS, FLOOR OPERATIONS					
Description	Unit Cost	Eastern DC		Western DC	
		Number of Units	Total Cost	Number of Units	Total Cost
Mobile Shelving Modules	159,870	15	$2,398,050	10	$1,598,700
Receiving Work Tables	790	4	3,160	2	1,580
Shelf Carts	430	4	1,720	2	860
Ladder Carts	540	2	1,080	1	540
Hand Pallet Jacks	750	1	750	1	750
Total Equipment Cost			$2,404,760		$1,602,430

As is readily apparent, there will be no significant equipment costs but mobile shelving. The tradeoffs between mobile shelving costs, building construction costs and occupancy costs were presented in Section 4.5.5, and the economics of mobile shelving are favorable. The mobile shelving envelope, column spacing, power supply, lighting, floor loading and rail installation must be closely integrated with building design and construction, and should properly be the

responsibility of the architect and general contractor. The equipment could be either purchased outright or leased. If leased, the annual lease costs would be approximately 10% of first costs, or $400,000, which is also equivalent to a 30-year fixed-rate annuity of the principal at 9.3% per annum.

In addition to floor operations equipment cost, there will also be a startup cost associated with office equipment. This cost is estimated at approximately $20,000 for Option A, and $14,000 for Options B and C, and excludes all ADP and telecommunications equipment, which are separately costed in Section 3 of the report. Office equipment includes desks, chairs, tables, file cabinets, bookshelves and other general and miscellaneous office assets, but excludes materials and supplies, which are separately estimated.

4.12 LABOR REQUIREMENTS AND COSTS

The estimated labor requirements and costs for the centers are discussed in the following subsections.

4.12.1 Pro Forma Staffing - Floor Operations

The pro forma staffing for floor operations in the Eastern DC and the Western DC are detailed by job function in Appendices 4-2 and 4-3, respectively. The staffing charts cover the receiving, stocking and shipping functions, and are identical for all options. Summary staffing requirements and pro forma labor costs in 1992 dollars are presented in Exhibit 4-H below.

Exhibit 4-H

PRO FORMA LABOR REQUIREMENTS AND COSTS, FLOOR OPERATIONS		
	Eastern DC	Western DC
Receiver/Stocker/Shippers Required	4	2
Annual Cost Per Worker	$22,640	$22,330
Total Annual Labor Costs	$90,560	$44,660

The rates used in calculating the annual costs of a worker were taken from the Register of Wage Determinations Under the Service Contract Act published by the U.S. Department of Labor as provided to ManTech by NLS, and include the specified allowance for fringe benefits. A 5% allowance has been added to the hourly rates to account for occasional overtime.

4.12.2 Productivity Improvement Potential - Floor Operations

Data on present daily shipping activity and the time required to receive, stock and ship braille books were obtained during our site visits to the Texas and Utah regional libraries. A comparison of these unit times with the pro forma unit times in the new distribution centers is presented in Exhibit 4-I below.

Exhibit 4-I

PRESENT AND PRO FORMA TIME REQUIRED TO RECEIVE, STOCK AND SHIP A BRAILLE BOOK						
	Present			Pro Forma		
	Texas Library	Utah Library	Total	Eastern DC	Western DC	Total
Copies Per Day	33	55	88	545	265	810
Minutes Per Copy	3.91	4.91	4.53	3.17	3.37	3.24
Hours Per Day	2.15	4.50	6.65	28.82	14.87	43.69
EFT Workers	.29	.60	.89	3.84	1.98	5.83

Assuming that the Texas and Utah libraries are representative of all regional libraries, the average time now required to receive, stock and ship a copy of a braille book is 4.53 minutes. This compares with a pro forma cycle time of 3.24 minutes per copy in the proposed distribution centers. The labor productivity improvement potential of a centralized braille book service is therefore 40%.

4.12.3 Pro Forma Staffing - Office Operations

The pro forma staffing and labor costs for office operations in the Eastern DC and the Western DC are presented in Exhibit 4-J below. The rates used in calculating the annual costs of labor were taken either from the Service Contract Act wage information provided by NLS, or from other U.S. Department of Labor statistics; a 30% fringe benefit loading was assumed.

Exhibit 4-J

PRO FORMA LABOR REQUIREMENTS AND COSTS, OFFICE OPERATIONS					
Option A					
Category	East	West	Total	Salary & Benefits	Cost
Manager	-	1	1	48,131	48,131
Manager/Supervisor	1	-	1	43,318	43,318
Reader Advisor	-	5	5	40,425	202,125
Clerical	2	1	3	23,389	70,167
Systems Analyst	-	1	1	47,962	47,962
Systems Programmer	-	1	1	37,687	37,687
Total	3	9	12	-	449,390
Options B & C					
Category	East	West	Total	Salary & Benefits	Cost
Manager	-	1	1	48,131	48,131
Manager/Supervisor	1	-	1	43,318	43,318
Reader Advisor	-	-	-	40,425	-
Clerical	2	2	4	23,389	93,556
Systems Analyst	-	1	1	47,962	47,962
Systems Programmer	-	1	1	37,687	37,687
Total	3	5	8		270,654

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The functional requirements for office operations were previously discussed in Section 4.9 with the exception of ADP related functions, which were presented in Section 3. The logic applied for the determination of staffing requirements is discussed below.

Managerial

Management functions will be performed by an overall manager, located at the primary site, and a supervisor/manager located at the secondary site.

Reader Advisor

Reader advisor staffing is based upon a combination of telephone answering requirements and the requirements for performing all other duties. The requirements for telephone reception were quantified in Section 2.6, and it was determined that 5 RAs is appropriate for the primary site (under Option A, assuming all patrons utilize centralized RA services), and that 43% of an RA's time would be spent on the phone - this allows adequate time for all other necessary activities previously discussed.

ALA standards call for 1 RA for each 1,200 "readers" given an automated circulation system, with total "readers" being defined as the number of active individuals and institutions. For the envisioned scenario, there would be 16,108 "readers" hence requiring 13.4 RAs if a full range of services (recorded as well as braille books) were being offered.

However, since reader advisors would handle only braille books, the number of RAs needed would be less, although the precise level is unclear. Section 2.6 presents one method for rationalizing the number of RAs, but it is recommended that new performance based standards be developed for the braille centers and RA staffing be based on those standards.

Clerical Support

ALA standards were not applicable to the quantification of clerical staffing at the centers for two reasons: 1) ALA standards refer to "support staff," which includes every labor category in a library except librarians, non-librarian RAs, data processing, custodial and security personnel... thus it is too broad a generalization to define clerical staff alone because it includes all distribution functions; and, 2) as was the case for reader advisors, the standards assume that initial registration with the free national library program for every patron, recorded book services and machine services are provided, which is not the case for the envisioned centers. Therefore, clerical staffing requirements estimates were independently assessed.

4.12.4 Provision for Absenteeism

With the small staffing requirement at each center, absenteeism for any reason could create a scheduling problem. However, the receiving, stocking and shipping activities are basically clerical in nature. Each center's manager and office workers (whether RAs, clerks or ADP staff) should therefore be qualified to substitute for an absent employee in the floor operations.

4.12.5 Labor Costs for Collection Conversion

There will be initial collection conversion costs if the decision is made to centralize braille services. With the exception of the relatively minor cost of pressure sensitive bar code labels, the cost of collection conversion is associated exclusively with labor and involves the affixing of the pressure sensitive bar code labels both to the spine and to the inside front cover of braille books and magazines, scanning of the labels, and key input of the book/magazine titles and volume numbers into the ADP system (the procedure is exactly the same as that previously described for entering new production copies into the system).

Assuming 1 minute per volume is required to perform this function (which includes any receiving, primary sorting and staging activities), 8 hours per day, and 250 working days per

year, one FTE will be able to enter 120,000 volumes per year into the system. With a total collection of slightly over 1.2 million volumes to be managed by both centers, approximately 10 man-years of effort will be required for this task, which is a start-up task, not a part of "normal" operations. Using the same wage rates as presented in Exhibit 4-H, a cost of $225,000 is estimated as being required for the conversion of existing collections, which does not include the cost for entering new production copies into the system (which are separately quantified). The details of how rapidly this should occur (1 year, 2 years, 5 years) will be determined in the transition plan.

4.13 IMPACT OF BRAILLE CENTRALIZATION ON THE REGIONAL LIBRARIES

It was assumed that all NLS-owned braille collections will be transferred from the RLs to the new distribution centers under the proposed consolidation. While this may not turn out to be the case, as with other aspects of the study it was taken as a fundamental assumption on which to base analysis. The potential impact of braille centralization on current RL operations is discussed below.

4.13.1 Potential Space Savings

The total area allocated to the receiving, storage and shipping of braille books at the Texas and Utah regional libraries was determined during our site visits and the size of their collections was confirmed. The current collections in all network libraries are estimated at 973,700 volumes, as shown in Exhibit 4-K below.

Exhibit 4-K

POTENTIAL SPACE SAVINGS IN THE REGIONAL LIBRARIES				
	Texas Library	Utah Library	Total	All Regional Libraries
Collection Size (Volumes)	46,400	75,600	122,000	973,700
Braille Area (Sq. Ft.)				
Storage	6,600	6,370	12,970	
Non Storage	760	550	1,310	
Total Braille Area (Sq. Ft.)	7,360	6,920	14,280	114,000

Assuming that the space allocations and storage densities in the Texas and Utah libraries are representative of all network braille libraries, the potential space savings to the network of a centralized braille book service will be approximately 114,000 square feet, which includes only floor operating space and no pro-rata share of office space. This compares with a pro forma space requirement of 42,700 square feet in the consolidated DCs for storage and non-storage floor operations.

4.13.2 Potential Labor Savings

As previously cited, the pro forma throughput requirement of the new braille distribution centers is 810 copies per day. Of this total, 33 copies are currently shipped by the MSC's. The remaining 777 copies are shipped by the network libraries, as shown in Exhibit 4-L below.

Exhibit 4-L

POTENTIAL LABOR SAVINGS IN THE REGIONAL LIBRARIES FLOOR OPERATIONS				
	Texas Library	Utah Library	Total	All Regional Libraries
Copies Per Day	33	55	88	777
Minutes Per Copy	3.91	4.91	4.53	4.53
Hours Per Day	2.15	4.50	6.65	58.66
EFT Workers	.29	.60	.89	7.82

Assuming that the receiving, stocking and shipping productivity of the Texas and Utah libraries are typical of all regional libraries, the potential floor operations labor savings to the regional libraries of a centralized braille book service will be 7.82 EFT workers. The labor savings to the regional libraries in office staff would be on a one-for-one basis, i.e., the figures shown in Exhibit 4-J less managerial and ADP staff.

4.14 IMPACT OF BRAILLE CENTRALIZATION ON THE MSC'S

All braille collections but the magazine archives will be transferred from the MSC's to the new distribution centers under the proposed consolidation. The potential impact of braille centralization on current MSC operations, and other possible MSC candidates for consolidation, are discussed below.

4.14.1 Pro Forma MSC Space Requirements and Costs

The total square footage and current space costs in the MSCE and the MSCW, and the pro forma area requirements and space costs with braille removed, are presented in Exhibit 4-M below.

Exhibit 4-M

PRO FORMA MSC SPACE REQUIREMENTS AND COSTS						
	Eastern MSC		Western MSC		Total	
	Square Feet	Annual Cost	Square Feet	Annual Cost	Square Feet	Annual Cost
Present MSC Space	16,000	$71,200	30,690	$92,340	46,690	$163,540
Pro Forma MSC Space	12,120	53,930	19,430	58,460	31,550	112,390
Net Savings	3,880	$17,770	11,260	$33,880	15,140	$51,150
% Reduction	24.2%		36.7%		32.4%	

These annual recurring costs include space rental, heat and power. Over 32% of all MSC space will be surplused by the consolidation of braille inventories in the new distribution centers, and vacating of this surplus space will generate a savings to the NLS of $51,150 per year.

4.14.2 Pro Forma MSC Labor Savings

Average daily throughput in the Western MSC is 19 braille books, and .75 EFT personnel are required to perform the receiving, stocking and shipping functions. Average daily throughput in the Eastern MSC is 14 books, and it is estimated (based upon MSCW operations) .55 EFT personnel are required. All of the 1.30 EFT personnel now assigned to braille in the MSC's would be surplused by the consolidation of braille inventories in the new distribution centers, and the potential labor savings to the NLS are $29,200 per year.

4.14.3 Other Possible MSC Candidates for Consolidation

As previously discussed, the space allocations, orientation of functions, and the planned directions of expansion will be identical under Options A, B and C with the exception of office operations. This will be the most cost-effective and efficient arrangement of the proposed distribution centers vis-a-vis the existing multistate centers, but does not specifically address the issue of whether or not to combine them.

The existing facilities wherein the MSCW and MSCE operations are currently located are unsuitable for the envisioned centers. Neither facility has the proper layout for the recommended operations and, in the case of the MSCE the facility, even in its entirety, is too small to support the pro forma storage requirement. Therefore, consolidation of the centers into existing MSC facilities is not feasible.

However, we believe that the real issue here is compatibility, as little would otherwise be gained by placing disparate distribution operations under one roof. Compatibility in this instance would be a common patron base, which is the braille readers; a common patron interface, which is that proposed under Options A, B, or C; and a bar coded package of comparable size. The most likely candidates will, therefore, be the magazine archives and audio machines, and this alternative will be fully evaluated in Study II of the contract.

4.15 ANTICIPATED BENEFITS TO THE NLS

With the project objective being to increase the availability of braille books to the readership, any benefits accruing to patrons will benefit the NLS as well. A centralized braille book storage and distribution system will enhance patron service in the ways described below.

4.15.1 Reduce the Incidence of Stockouts

Pooling of distributed inventories will mollify the effects of random demand and therefore reduce the required size of safety stocks, and this well accepted distribution strategy was presented in Section 2.1.5 and the logic documented in Appendix 2-1. The concept can be simply described by a hypothetical example.

If two regional libraries each have one copy of a title, and one library has a patron demand of two copies while the other has none, one request will go unfilled unless a transfer is made between libraries putting supply and demand in balance, and promptly serving both patrons.

4.15.2 More, Better and Faster Information on Availability

The automation and telecommunications systems outlined in Section 3 will record the instant status of all books in the distribution network, thus providing a central clearinghouse for information on book availability. An order for an available book can then be entered with assurance that the book will be shipped to the patron specified.

4.15.3 Better Knowledge of Reader Preferences

A universal subject coding system for all titles will be part of the automation database, and patron preferences will be redefined to conform with new and existing subject codes. This information, in consort with patron demographics and restrictors, which will also be in the central database, will enable the NLS to refine the new title selection process to better mesh with expressed reader interest.

4.15.4 More, Better and Faster Information on Circulation

A time-phased history file of actual patron demand for individual titles will be utilized in conjunction with expressed reader interest to better size production quantities to match projected demand. For example, if 60 copies per title are produced on average, the production run of an anticipated fast mover can increase to 90 copies, and the production run of an anticipated slow mover can decrease to 30 copies, at the same total cost.

This circulation record will also be employed in selecting the titles and quantities to be remaindered. This necessary weeding process has a major impact on project economics, as the first cost of one volume of storage capacity in the new distribution centers will be $5.38.

4.15.5 Better Managerial Control of Collections

Centralized braille storage and distribution will further benefit the NLS by providing more direct and more timely control of government property. Specifically, the NLS will know, at any

time, exactly how many copies and volumes of each title there are in the collections, and which copies are in-house or in-float, who has what copies, and how long they have had them. Uniform and equitable decision rules will then be applied to pinpoint custody and to police the return of overdue books.

SECTION 5

PROJECTED COSTS OF OPTIONS

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Section 5
PROJECTED COSTS OF OPTIONS

This section of the report presents the projected costs of startup, conversion and continuing operations at the envisioned braille central distribution centers. This presentation is at a summary level; the reader is referred to Sections 3 and 4 of the report and associated appendices for more detailed presentations of costs.

5.1 TYPES OF COSTS

Each option is presented with costs categorized as to whether they are startup costs, annual operating costs, or conversion costs (although conversion costs could be considered to be startup costs if they are incurred upon the initialization of service). Startup costs are associated with capital investments in facility space, equipment of all types, the purchase or development of software, and any other investment that results in the availability of long-lived capital assets to the centers' operations, whether the assets are purchased, or long-term leases are executed. Annual operating costs are associated with any expenditures that support the deployment of resources for normal, on-going operations, which include labor, occupancy costs of all types exclusive of the cost for the facility space itself, telecommunications connect time, materials and supplies, support services, administrative overhead, and miscellaneous expenditures. Conversion costs are associated with the costs of collection conversion (and initial conversion of patron reader histories transferred to the centers under Option A).

5.2 TIME FRAME AND TYPES OF PROJECTIONS

A stated requirement of the study is to develop a five-year projection of costs for each option considered. This projection has been performed, showing startup costs in Year 1 and annual operating costs for each of the next four years. This is essentially a "cash flow" projection, and recognizes the full cost of a capital asset in the time period in which it is purchased.

The timing of collection and patron data conversion costs is somewhat variable and is dependent upon the transition plan to be formulated in the last phase of this study. It was assumed that the same conversion scheme would apply to each option, and that conversion would occur uniformly over a five-year time frame... this is by no means "a given," and could occur over a shorter time frame if a more rapid transition plan is implemented.

Because the most expensive assets have useful lives far in excess of five years, it is also important to develop a projection that yields an average annualized cost of operations. These projections are also presented in the exhibits, and are shown for the first year of operation. Furthermore, two projections are shown for the annualized cost calculations; one assumes that NLS has a zero cost-of-capital, and the other assumes that NLS's cost-of-capital is the rate for long-term U.S. Government debt, which is currently 7.5% per annum. The representativeness of each of the annualized projections is dependent upon the assumption of whether funds for the purchase of long-term assets would be financed via tax revenues, in which case the zero cost-of-capital data is relevant, or deficit financed, in which case the 7.5% cost-of-capital data is relevant. Finally, two separate exhibits are shown for each option, the first of which assumes that facilities and distribution and storage equipment are purchased, and the second of which assumes they are leased.

5.3 COSTS OF OPTIONS

Exhibits 5-A and 5-B, 5-C and 5-D, and 5-E and 5-F present the projected costs for Options A, B and C, respectively. A 3% annual inflation rate has been assumed for all conversion and operating costs in the five-year projections. Below follows a listing of major cost areas, what is included in each, and any relevant assumptions made.

- Labor - Includes total salary and benefits costs for all personnel in both centers.
- Telecommunications - Includes costs for voice and data communications hardware and software, to be borne by the centers, including the network link and fax machine purchase and installation. Seven-year life assumed.
- Materials and Supplies - Includes all supplies for office and warehouse operations not directly borne by NLS.

- Hardware Maintenance - Includes all maintenance costs for computer hardware.

- Administrative Overhead - It was assumed in the development of resource requirements that administrative overhead for the centers' operations would be provided by an external entity, specifically the parent or administrating organization of the successful bidder. This cost was estimated as 10% of the total labor cost, which is probably slightly conservative.

- Software Maintenance - Includes all maintenance costs for all software.

- Occupancy - Includes all utilities and city services, maintenance and repairs to facilities and mobile shelving, and custodial and security services.

- Miscellaneous - Includes photocopy machine rental and servicing, and other, non-specified costs borne by centers.

- Conversion, Collection - Includes costs for conversion of existing collections to centralized system. This investment is amortized over thirty years for annualized cost calculation.

- Conversion, Patron Data - Includes costs for conversion of patron data to centralized system. This investment is amortized over thirty years for annualized cost calculation.

- Facilities - Includes all costs associated with initial construction and site preparation, or leasing. If leased, annual cost is estimated at 10% of first costs. If owned, annual cost is estimated by 30-year amortization.

- Storage and Distribution Equipment - Includes all costs for mobile shelving, tables, shelf carts, ladder carts and pallet jacks, owned or leased. If leased, annual cost is estimated at 10% of first costs. If owned, annual cost is estimated by 30-year amortization.

- ADP Hardware - Includes all costs for computers and peripherals, 7-year life assumed.

- ADP Software - Includes all costs for software exclusive of network software, including installation and training, 7-year life assumed.

- Office Equipment - Includes all costs associated with purchased office area equipment exclusive of ADP and telecommunications systems, 20-year life assumed.

The costs shown in Exhibits 5-A through 5-F should be contrasted with the estimated total costs for current network braille operations derived in the previous study, which is approximately

$3,154,000 per year incurred by network agencies, and $173,000 per year incurred by NLS for MSC provided braille services. While Options B and C necessitate both the provision of reader advisory services from regional libraries and the modification of local ADP systems for the successful implementation of centralization, together with the associated costs for the provision of the RA services and the ADP modifications, which are not shown in the exhibits, Option A requires neither. The costs shown for Option A assume 100% of reader advisory services are centrally provided, and there would be no incremental effort on the part of network libraries to forward patron information changes to the centers because a single-step notification process to NLS is assumed. The significant net cost savings via centralization for Option A occur for essentially three reasons; (1) much lower facility space unit costs than the status quo, (2) economies of scale in the distribution and storage functions, and (3) streamlined distribution and storage operations employing comprehensive ADP support, optimal facility layout, and modern operating techniques.

EXHIBIT 5-A

PROJECTED COSTS OF OPTION A PURCHASE OF FACILITY AND STORAGE EQUIPMENT							
COST ELEMENT	**YEAR 1**	**YEAR 2**	**YEAR 3**	**YEAR 4**	**YEAR 5**	**ANNUALIZED COST(1)**	**ANNUALIZED COST(2)**
START-UP							
FACILITIES	1,740,000					147,328	58,000
STOR. & DIST. EQUIPMENT	4,007,190					339,294	133,573
ADP HARDWARE	100,951					19,060	14,422
ADP SOFTWARE	207,450					39,167	29,636
TELECOMMUNICATIONS	36,138					6,823	5,163
OFFICE EQUIPMENT	20,000					1,962	1,000
SUB-TOTAL	**6,111,729**	**0**	**0**	**0**	**0**	**553,633**	**241,793**
CONVERSION							
COLLECTION	45,000	46,350	47,741	49,173	50,648	7500	7,500
PATRON HISTORY DATA	3,000	3,090	3,183	3,278	3,377	500	500
SUB-TOTAL	**48,000**	**49,440**	**50,923**	**52,451**	**54,024**	**8,000**	**8,000**
OPERATING							
LABOR	584,610	602,148	620,213	638,819	657,984	584,610	584,610
TELECOMMUNICATIONS	81,792	84,246	86,773	89,376	92,058	81,792	81,792
MATERIALS & SUPPLIES	15,000	15,450	15,914	16,391	16,883	15,000	15.000
HARDWARE MAINTENANCE	3,600	3,708	3,819	3,934	4,052	3,600	3,600
SOFTWARE MAINTENANCE	8,850	9,116	9,389	9,671	9,961	8,850	8,850
OCCUPANCY	85,785	88,358	91,009	93,739	96,551	85,785	85,785
MISCELLANEOUS	5,000	5,150	5,305	5,464	5,628	5,000	5,000
ADMINISTRATIVE OVERHEAD	58,461	60,215	62,021	63,882	65,798	58,461	58,461
SUB-TOTAL	**843,098**	**868,390**	**894,442**	**921,275**	**948,914**	**843,098**	**843,098**
TOTAL COSTS	**7,002,827**	**917,830**	**945,365**	**973,726**	**1,002,938**	**1,404,730**	**1,092,890**

(1) - ASSUMES A 7.5% COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.
(2) - ASSUMES NO COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.

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EXHIBIT 5-B

PROJECTED COSTS OF OPTION A LEASE OF FACILITY AND STORAGE EQUIPMENT							
COST ELEMENT	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	ANNUALIZED COST(1)	ANNUALIZED COST(2)
START-UP							
FACILITIES	174,000	174,000	174,000	174,000	174,000	174,000	174,000
STOR. & DIST. EQUIPMENT	400,719	400,719	400,719	400,719	400,719	400,719	400,719
ADP HARDWARE	100,951					19,060	14,422
ADP SOFTWARE	207,450					39,167	29,636
TELECOMMUNICATIONS	36,138					6,823	5,163
OFFICE EQUIPMENT	20,000					1,962	1,000
SUB-TOTAL	939,258	574,719	574,719	574,719	574,719	641,730	624,939
CONVERSION							
COLLECTION	45,000	46,350	47,741	49,173	50,648	7500	7,500
PATRON HISTORY DATA	3,000	3,090	3,183	3,278	3,377	500	500
SUB-TOTAL	48,000	49,440	50,923	52,451	54,024	8,000	8,000
OPERATING							
LABOR	584,610	602,148	620,213	638,819	657,984	584,610	584,610
TELECOMMUNICATIONS	81,792	84,246	86,773	89,376	92,058	81,792	81,792
MATERIALS & SUPPLIES	15,000	15,450	15,914	16,391	16,883	15,000	15,000
HARDWARE MAINTENANCE	3,600	3,708	3,819	3,934	4,052	3,600	3,600
SOFTWARE MAINTENANCE	8,850	9,116	9,389	9,671	9,961	8,850	8,850
OCCUPANCY	85,785	88,358	91,009	93,739	96,551	85,785	85,785
MISCELLANEOUS	5,000	5,150	5,305	5,464	5,628	5,000	5,000
ADMINISTRATIVE OVERHEAD	58,461	60,215	62,021	63,882	65,798	58,461	58,461
SUB-TOTAL	843,098	868,390	894,442	921,275	948,914	843,098	843,098
TOTAL COSTS	1,830,356	1,492,549	1,520,084	1,548,445	1,577,657	1,492,827	1,476,036

(1) - ASSUMES A 7.5% COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.
(2) - ASSUMES NO COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.

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EXHIBIT 5-C

PROJECTED COSTS OF OPTION B PURCHASE OF FACILITY AND STORAGE EQUIPMENT							
COST ELEMENT	**YEAR 1**	**YEAR 2**	**YEAR 3**	**YEAR 4**	**YEAR 5**	**ANNUALIZED COST(1)**	**ANNUALIZED COST(2)**
START-UP							
FACILITIES	1,713,000					145,042	57,100
STOR. & DIST. EQUIPMENT	4,007,190					339,294	133,573
ADP HARDWARE	98,797					18,653	14,114
ADP SOFTWARE	205,450					38,789	29,350
TELECOMMUNICATIONS	30,400					5,740	4,343
OFFICE EQUIPMENT	14,000					1,373	700
SUB-TOTAL	**6,068,837**	**0**	**0**	**0**	**0**	**548,890**	**239,180**
CONVERSION							
COLLECTION	45,000	46,350	47,741	49,173	50,648	7500	7,500
PATRON HISTORY DATA	0	0	0	0	0	0	0
SUB-TOTAL	**45,000**	**46,350**	**47,741**	**49,173**	**50,648**	**7,500**	**7,500**
OPERATING							
LABOR	405,874	418,050	430,592	443,509	456,815	405,874	405,874
TELECOMMUNICATIONS	47,320	48,740	50,202	51,708	53,259	47,320	47,320
MATERIALS & SUPPLIES	12,000	12,360	12,731	13,113	13,506	12,000	12,000
HARDWARE MAINTENANCE	3,600	3,708	3,819	3,934	4,052	3,600	3,600
SOFTWARE MAINTENANCE	8,850	9,116	9,389	9,671	9,961	8,850	8,850
OCCUPANCY	84,638	87,177	89,792	92,486	95,260	84,638	84,638
MISCELLANEOUS	3,500	3,605	3,713	3,825	3,939	3,500	3,500
ADMINISTRATIVE OVERHEAD	40,587	41,805	43,059	44,351	45,681	40,587	40,587
SUB-TOTAL	**606,369**	**624,560**	**643,297**	**662,596**	**682,474**	**606,369**	**606,369**
TOTAL COSTS	**6,720,206**	**670,910**	**691,037**	**711,768**	**733,121**	**1,162,759**	**853,049**

(1) - ASSUMES A 7.5% COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.
(2) - ASSUMES NO COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.

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EXHIBIT 5-D

PROJECTED COSTS OF OPTION B
LEASE OF FACILITY AND STORAGE EQUIPMENT

COST ELEMENT	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	ANNUALIZED COST(1)	ANNUALIZED COST(2)
START-UP							
FACILITIES	171,300	171,300	171,300	171,300	171,300	171,300	171,300
STOR. & DIST. EQUIPMENT	400,719	400,719	400,719	400,719	400,719	400,719	400,719
ADP HARDWARE	98,797					18,653	14,114
ADP SOFTWARE	205,450					38,789	29,350
TELECOMMUNICATIONS	30,400					5,740	4,343
OFFICE EQUIPMENT	14,000					1,373	700
SUB-TOTAL	920,666	572,019	572,019	572,019	572,019	636,574	620,526
CONVERSION							
COLLECTION	45,000	46,350	47,741	49,173	50,648	7500	7,500
PATRON HISTORY DATA	0	0	0	0	0	0	0
SUB-TOTAL	45,000	46,350	47,741	49,173	50,648	7,500	7,500
OPERATING							
LABOR	405,874	418,050	430,592	443,509	456,815	405,874	405,874
TELECOMMUNICATIONS	47,320	48,740	50,202	51,708	53,259	47,320	47,320
MATERIALS & SUPPLIES	12,000	12,360	12,731	13,113	13,506	12,000	12,000
HARDWARE MAINTENANCE	3,600	3,708	3,819	3,934	4,052	3,600	3,600
SOFTWARE MAINTENANCE	8,850	9,116	9,389	9,671	9,961	8,850	8,850
OCCUPANCY	84,638	87,177	89,792	92,486	95,260	84,638	84,638
MISCELLANEOUS	3,500	3,605	3,713	3,825	3,939	3,500	3,500
ADMINISTRATIVE OVERHEAD	40,587	41,805	43,059	44,351	45,681	40,587	40,587
SUB-TOTAL	606,369	624,560	643,297	662,596	682,474	606,369	606,369
TOTAL COSTS	1,572,035	1,242,929	1,263,056	1,283,787	1,305,140	1,250,443	1,234,395

(1) - ASSUMES A 7.5% COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.
(2) - ASSUMES NO COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.

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EXHIBIT 5-E

PROJECTED COSTS OF OPTION C PURCHASE OF FACILITY AND STORAGE EQUIPMENT							
COST ELEMENT	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	ANNUALIZED COST(1)	ANNUALIZED COST(2)
START-UP							
FACILITIES	1,713,000					145,042	57,100
STOR. & DIST. EQUIPMENT	4,007,190					339,294	133,573
ADP HARDWARE	98,797					18,653	14,114
ADP SOFTWARE	189,700					35,815	27,100
TELECOMMUNICATIONS	13,300					2,511	1,900
OFFICE EQUIPMENT	14,000					1,373	700
SUB-TOTAL	6,021,987	0	0	0	0	542,688	234,487
CONVERSION							
COLLECTION	45,000	46,350	47,741	49,173	50,648	7500	7,500
PATRON HISTORY DATA	0	0	0	0	0	0	0
SUB-TOTAL	45,000	46,350	47,741	49,173	50,648	7,500	7,500
OPERATING							
LABOR	405,874	418,050	430,592	443,509	456,815	405,874	405,874
TELECOMMUNICATIONS	30,662	31,582	32,529	33,505	34,510	30,662	30,662
MATERIALS & SUPPLIES	12,000	12,360	12,731	13,113	13,506	12,000	12,000
HARDWARE MAINTENANCE	3,600	3,708	3,819	3,934	4,052	3,600	3,600
SOFTWARE MAINTENANCE	8,850	9,116	9,389	9,671	9,961	8,850	8,850
OCCUPANCY	84,638	87,177	89,792	92,486	95,260	84,638	84,638
MISCELLANEOUS	3,000	3,090	3,183	3,278	3,377	3,000	3,000
ADMINISTRATIVE OVERHEAD	40,587	41,805	43,059	44,351	45,681	40,587	40,587
SUB-TOTAL	589,211	606,887	625,094	643,847	663,162	589,211	589,211
TOTAL COSTS	6,656,198	653,237	672,834	693,019	713,810	1,139,399	831,198

(1) - ASSUMES A 7.5% COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.
(2) - ASSUMES NO COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.

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EXHIBIT 5-F

PROJECTED COSTS OF OPTION C LEASE OF FACILITY AND STORAGE EQUIPMENT							
COST ELEMENT	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	ANNUALIZED COST(1)	ANNUALIZED COST(2)
START-UP							
FACILITIES	171,300	171,300	171,300	171,300	171,300	171,300	171,300
STOR. & DIST. EQUIPMENT	400,719	400,719	400,719	400,719	400,719	400,719	400,719
ADP HARDWARE	98,797					18,653	14,114
ADP SOFTWARE	189,700					35,815	27,100
TELECOMMUNICATIONS	13,300					2,511	1,900
OFFICE EQUIPMENT	14,000					1,373	700
SUB-TOTAL	873,816	572,019	572,019	572,019	572,019	630,372	615,833
CONVERSION							
COLLECTION	45,000	46,350	47,741	49,173	50,648	7500	7,500
PATRON HISTORY DATA	0	0	0	0	0	0	0
SUB-TOTAL	45,000	46,350	47,741	49,173	50,648	7,500	7,500
OPERATING							
LABOR	405,874	418,050	430,592	443,509	456,815	405,874	405,874
TELECOMMUNICATIONS	30,662	31,582	32,529	33,505	34,510	30,662	30,662
MATERIALS & SUPPLIES	12,000	12,360	12,731	13,113	13,506	12,000	12,000
HARDWARE MAINTENANCE	3,600	3,708	3,819	3,934	4,052	3,600	3,600
SOFTWARE MAINTENANCE	8,850	9,116	9,389	9,671	9,961	8,850	8,850
OCCUPANCY	84,638	87,177	89,792	92,486	95,260	84,638	84,638
MISCELLANEOUS	3,000	3,090	3,183	3,278	3,377	3,000	3,000
ADMINISTRATIVE OVERHEAD	40,587	41,805	43,059	44,351	45,681	40,587	40,587
SUB-TOTAL	589,211	606,887	625,094	643,847	663,162	589,211	589,211
TOTAL COSTS	1,508,027	1,225,256	1,244,853	1,265,038	1,285,829	1,227,083	1,212,544

(1) - ASSUMES A 7.5% COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.
(2) - ASSUMES NO COST-OF-CAPITAL FOR PURCHASED LONG-TERM ASSETS.

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APPENDICES

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APPENDIX 1-1

Recommended Model for Centralized Braille Book Distribution System

Introduction:

In the following model, copies of all braille titles produced for or purchased by NLS will be held in two centers. These centers, located in Salt Lake City, Utah, and Cincinnati, Ohio, will be independent of the multistate centers. A participating library will be a regional library that chooses to provide braille books to its patrons from the centers. It may choose also to retain a browsing collection. Deposit collections will be furnished by the centers to qualified sites recommended by participating libraries. Magazine subscriptions will continue to be maintained by a patron's network library.

Model:

- All reader advisors for the central system will be located at one center, which will serve as the focal point for all communications between centers and patrons and between centers and regional libraries. Those participating libraries that wish to retain braille reader advisors on site ("reader-advisor libraries") may do so.

- Patrons nationwide will have access to the centers, regardless of their regional library's participation.

- Patron registration will occur at the regional library, or, for interested patrons of non-participating libraries, at the centers.

- The participating library will be the authority for patron information such as name, address, ID number, etc.

- Reader profiles will be created and maintained on the centers' database by reader advisors at either the center or the reader-advisor library. Regardless of where the profiles are created, both the center and the library may modify them in response to a patron's request.

- The automated selection of books based on reader profiles will be performed at the centers.

- Subject coding of books will be done centrally.

- Participating libraries will have on-line access to the centers' database to perform queries, create or modify patron profiles, input requests or reserves, etc.

- A single notification from participating libraries regarding patron information (patron adds and deletes, address changes, etc.) will update both CMLS and the centers' database.

- Reader-advisor libraries will be provided with a "patron due for service" report. Responsibility for acting on this report will lie with the participating library unless the patron prefers to be served by a reader advisor from the centers.

- Patron service information (address changes, patron deceased, etc.) will be provided only to participating libraries.

- If feasible, the centers' database will permit patrons to order books through an automated interface with patron input via a touchtone telephone.

APPENDIX 1-2

Committee Recommendations for Inclusion in Model

Visitors to a center should have the opportunity to tour the facility and to check out books on the spot.

Browsing collections maintained at participating libraries could contain a variety of materials but should generally not house books currently in high demand, as these would be best utilized in the circulating collection.

Reference books would be most useful if housed with browsing collections, but should also be available to be loaned via the central system.

The automated system must be accessible to all employees via adaptive devices.

System database should:

1. contain the full BLND collection,

2. contain the full MARC record,

3. accommodate keyword searching.

Contractor should investigate the possiblity of offering a Public Access Catalog feature.

Staffing pattern should include:

1. direct supervision of reader advisors by someone other than the center manager,

2. subject-coding staff.

Reader advisors should hold MLS degrees. Clerical support should be available for nonprofessional activities.

Hawaii should retain a full braille collection, since shipping time from the mainland is prohibitively long.

Center management must carry out plans for motivation of staff, especially clerical and materials handling.

Advisory committees for centers should be formed and should include patrons (majority of committee) and network-library representatives.

The test proposed by NLS to determine actual mailing times (rather than Postal Service standards) from center sites is needed.

Some method for providing rush delivery of books should be available for legitimate requests. It must allow for delivery even when patron is not at home to sign for receipt of package.

The automated system must generate a report on circulation for use with collection development activities.

Center facilities as a whole, and compact shelving units in particular, must be in compliance with the Americans with Disabilities Act.

APPENDIX 2-1
THEORETICAL POTENTIAL OF BR COLLECTION SIZE REDUCTION UPON CENTRAL CONSOLIDATION

Assumptions:

- Current National BR Circulation = 200,000 copies/year
- Current National BR Collection Size = (8,500 titles) (60 copies/title) = 510,000 copies
- Current Number of Stockage Points = 39 sites
- Current Average Copies/Title = **60 copies/title**
- Pro Forma Number of Stockage Points = 2 sites

(1) Average Stockage Per Distributed Site = 60 ÷ 39 = 1.538 copies/title/site

(2) Average Circulation Per Title Per Year = 200,000 ÷ 510,000 = 0.392 copies/title/year

(3) Average Distributed Site Safety Stock Level (1) = 1.538 - 0.392 = 1.146 copies/title

(4) Consolidated Collection Requirement at 2 Centers (2) = 0.392 (20) + 0.392 (19) + 1.146 $\sqrt{20}$ + 1.146 $\sqrt{19}$ = **25.4 copies/title**

Notes: (1) - Assumes a book is in float for 1 year... otherwise required safety stocks are even lower than presented.

(2) - Two centers assumed to be of approximately equal size.

APPENDIX 2-2

BRAILLE READERSHIP PROFILE AND PRO FORMA FY91

STATE	CITY(2)	REGION	INDIVIDUAL READERSHIP	DEPOSIT COLLECTION READERSHIP	ESTIMATED TOTAL READERS(1)
ALASKA	ANCHORAGE	WEST	19	2	27
ARIZONA	PHOENIX	WEST	66	1	70
CALIFORNIA	LOS ANGELES	WEST	573	53	785
CALIFORNIA	SACRAMENTO	WEST	601	49	797
COLORADO	DENVER	WEST	134	4	150
HAWAII	HONOLULU	WEST	83	1	87
IDAHO	BOISE	WEST	43	2	51
IOWA	DES MOINES	WEST	417	9	453
KANSAS	EMPORIA	WEST	80	1	84
MINNESOTA	FARIBAULT	WEST	432	15	492
MONTANA	HELENA	WEST	23		23
NEBRASKA	LINCOLN	WEST	69	10	109
NEVADA	CARSON CITY	WEST	16	1	20
NEW MEXICO	SANTA FE	WEST	82	2	90
NORTH DAKOTA	GRAND FORKS	WEST	20		20
OKLAHOMA	OKLAHOMA CITY	WEST	134	7	162
OREGON	SALEM	WEST	151	6	175
SOUTH DAKOTA	PIERRE	WEST	39		39
TEXAS	AUSTIN	WEST	1,165	254	2,181
UTAH	SALT LAKE CITY	WEST	166	13	218
WASHINGTON	SEATTLE	WEST	364	28	476
WYOMING	CHEYENNE	WEST	17	4	33
ALABAMA	MONTGOMERY	EAST	191	16	255
ARKANSAS	LITTLE ROCK	EAST	114	5	134
CONNECTICUT	ROCKY HILL	EAST	267	15	327
DELAWARE	DOVER	EAST	50	7	78
DIST.OF COL.	WASHINGTON	EAST	60	1	64
FLORIDA	DAYTONA BEACH	EAST	584	61	828
GEORGIA	ATLANTA	EAST	262	22	350
ILLINOIS	CHICAGO	EAST	584	49	780
INDIANA	INDIANAPOLIS	EAST	283	19	359
KENTUCKY	FRANKFORT	EAST	105	12	153
LOUISIANA	BATON ROUGE	EAST	303	18	375
MAINE	AUGUSTA	EAST	59	1	63
MARYLAND	BALTIMORE	EAST	133	6	157
MASSACHUSETTS	WATERTOWN	EAST	646	31	770
MICHIGAN	LANSING	EAST	913	127	1,421
MISSISSIPPI	JACKSON	EAST	95	1	99
MISSOURI	JEFFERSON CITY	EAST	522	57	750
NEW HAMPSHIRE	CONCORD	EAST	35	1	39
NEW JERSEY	TRENTON	EAST	510	4	526
NEW YORK	ALBANY (3)	EAST	573	159	1,210
NEW YORK	NEW YORK	EAST	619	17	687
NORTH CAROLINA	RALEIGH	EAST	404	29	520
OHIO	CINCINNATI	EAST	171	124	667
OHIO	CLEVELAND	EAST	450	34	586
PENNSYLVANIA	PHILADELPHIA	EAST	1,038	51	1,242

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APPENDIX 2-2 (CONTINUED)

BRAILLE READERSHIP PROFILE AND PRO FORMA FY91					
STATE	CITY(2)	REGION	INDIVIDUAL READERSHIP	DEPOSIT COLLECTION READERSHIP	ESTIMATED TOTAL READERS(1)
PUERTO RICO	SAN JUAN	EAST	81	15	141
RHODE ISLAND	PROVIDENCE	EAST	40		40
SOUTH CAROLINA	COLUMBIA	EAST	74	2	82
TENNESSEE	NASHVILLE	EAST	163	12	211
VERMONT	MONTPELIER	EAST	45	3	57
VIRGIN ISLANDS	ST.CROIX	EAST		1	4
VIRGINIA	RICHMOND	EAST	232	13	284
WEST VIRGINIA	CHARLESTON	EAST	131	9	167
WISCONSIN	MILWAUKEE	EAST	278	1	282
OVERSEAS	MSCs (4)	BOTH	14		14
TOTAL READERSHIP (5)		TOTAL	14,723	1,385	20,264
		MINIMUM	14	1	4
		MAXIMUM	1,165	254	2,181
		AVERAGE	263	27	356
		STD.DEV.	269	46	416
READERSHIP BY REGION		WEST	4,701	462	6,549
		EAST	10,022	923	13,715
% OF READERSHIP BY REGION		WEST	31.9%	33.4%	32.3%
		EAST	68.1%	66.6%	67.7%

NOTE:(1) EACH DEPOSIT COLLECTION ASSUMED TO HAVE FOUR BRAILLE PATRONS, THE STANDARD NLS APPROXIMATION. THIS AVERAGE COULD BE HIGHER, e.g. (SIX) READERS PER INSTITUTION, IN SOME STATES.

(2) CITY SHOWN HOUSES REGIONAL LIBRARY/MLA FOR THAT STATE/PART OF STATE. BRAILLE SERVICES MAY OR MAY NOT ORIGINATE FROM THESE LOCATIONS.

(3) ACTUAL NUMBER OF INDIVIDUALS SERVED WITHIN DEPOSIT COLLECTIONS REPORTED BY LIBRARY. NUMBER OF INSTITUTIONS SERVED ESTIMATED PER (1).

(4) OVERSEAS READERS CURRENTLY SERVED FROM MSCW ; PRO FORMA ASSUMES HALF SERVED FROM EASTERN CENTER, HALF SERVED FROM WESTERN CENTER.

(5) ALL FIGURES EXCLUDE MUSIC IN BRAILLE, WHICH WILL NOT BE HANDLED BY CENTERS.

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APPENDIX 2-3

PATRON CIRCULATION PROFILE OF UTAH RL OUT-OF-STATE BRAILLE READERS				
Number of Books Circulated	Number of Patrons	Percent of Patrons	Number of Books	Percent of Books
0	203	30%	0	0%
1-5	191	28%	504	7%
6-10	96	14%	730	11%
11-20	92	14%	1,401	20%
21-40	50	7%	1,370	20%
41+	40	6%	2,876	42%
	672	100%	6,881	100%

APPENDIX 2-4

BRAILLE CIRCULATION NETWORK LIBRARIES FY91 SORTED BY REGION								
STATE	CITY	REGION	INDIVIDUAL CIRCULATION	DEPOSIT COLLECTION CIRCULATION	INTER-LIBRARY LOAN	TOTAL(1) CIRC. (VOLUMES)	PROBABLE REPORTING UNIT	ESTIMATED ADJUSTED TOTAL(1) CIRC. (COPIES)
ALASKA	ANCHORAGE	WEST	200	60		260	COPIES	260
ARIZONA	PHOENIX	WEST	1,700	1		1,701	COPIES	1,701
CALIFORNIA	LOS ANGELES	WEST	8,800	500	30	9,330	COPIES	9,330
CALIFORNIA	SACRAMENTO	WEST	12,700	500	30	13,230	COPIES	13,230
COLORADO	DENVER	WEST	2,100	100		2,200	COPIES	2,200
HAWAII	HONOLULU	WEST	1,100	10		1,110	VOLUMES	493
IDAHO	BOISE	WEST	500	2		502	COPIES	502
IOWA	DES MOINES	WEST	9,900			9,900	VOLUMES	4,400
KANSAS	EMPORIA	WEST	1,400	17		1,417	VOLUMES	630
MINNESOTA	FARIBAULT	WEST	5,800	100		5,900	VOLUMES	2,622
MONTANA	HELENA	WEST	300			300	COPIES	300
NEBRASKA(2)	LINCOLN	WEST	300	100		400	COPIES	400
NEBRASKA(2)	VIA UTAH	WEST	1,100	100		1,200	COPIES	1,200
NEVADA	CARSON CITY	WEST	200	40		240	COPIES	240
NEW MEXICO	SANTA FE	WEST	900	100		1,000	COPIES	1,000
NORTH DAKOTA	GRAND FORKS	WEST	200			200	COPIES	200
OKLAHOMA(2)	VIA UTAH	WEST	800	20		820	COPIES	820
OKLAHOMA(2)	OKLAHOMA CITY	WEST	1,100		80	1,180	VOLUMES	524
OREGON	SALEM	WEST	3,600	100		3,700	VOLUMES	1,644
SOUTH DAKOTA	PIERRE	WEST	500			500	COPIES	500
TEXAS	AUSTIN	WEST	8,500	1,600		10,100	COPIES	10,100
UTAH	SALT LAKE CY.	WEST	1,500	50	600	2,150	COPIES	2,150
WASHINGTON	SEATTLE	WEST	25,300	600		25,900	VOLUMES	11,511
WYOMING	CHEYENNE	WEST	100	40		140	COPIES	140
ALABAMA	MONTGOMERY	EAST	3,200	200	60	3,460	VOLUMES	1,538
ARKANSAS	LITTLE ROCK	EAST	2,600	60	20	2,680	VOLUMES	1,191
CONNECTICUT	ROCKY HILL	EAST	3,200	30		3,230	COPIES	3,230
DELAWARE	DOVER	EAST	1,100	40		1,140	COPIES	1,140
DIST.OF COL.	WASHINGTON	EAST	1,000			1,000	VOLUMES	444
FLORIDA	DAYTONA BEACH	EAST	13,600	2,300	300	16,200	VOLUMES	7,200
GEORGIA	ATLANTA	EAST	3,100	60		3,160	COPIES	3,160
ILLINOIS	CHICAGO	EAST	8,100	300	7,800	16,200	VOLUMES	7,200
INDIANA	INDIANAPOLIS	EAST	6,200	100	80	6,380	VOLUMES	2,836
KENTUCKY	FRANKFORT	EAST	2,000	300	40	2,340	VOLUMES	1,040
LOUISIANA	BATON ROUGE	EAST	3,500	400		3,900	COPIES	3,900
MAINE	AUGUSTA	EAST	700	4		704	COPIES	704
MARYLAND	BALTIMORE	EAST	1,700	20		1,720	COPIES	1,720
MASSACHUSETTS	WATERTOWN	EAST	4,200	200		4,400	COPIES	4,400
MICHIGAN	LANSING	EAST	8,700	500		9,200	COPIES	9,200
MISSISSIPPI	JACKSON	EAST	1,200	10		1,210	VOLUMES	538
MISSOURI	JEFFERSON CY.	EAST	9,100	400	100	9,600	VOLUMES	4,267
NEW HAMPSHIRE	CONCORD	EAST	400	30		430	COPIES	430
NEW JERSEY	TRENTON	EAST	11,700	400		12,100	VOLUMES	5,378
NEW YORK	ALBANY	EAST	7,800	1,700		9,500	COPIES	9,500
NEW YORK	NEW YORK	EAST	8,700	300		9,000	COPIES	9,000
NORTH CAROLINA	RALEIGH	EAST	9,100	400		9,500	VOLUMES	4,222

APPENDIX 2-4 (Continued)

BRAILLE CIRCULATION NETWORK LIBRARIES FY91 SORTED BY REGION								ESTIMATED ADJUSTED
STATE	CITY	REGION	INDIVIDUAL CIRCULATION	DEPOSIT COLLECTION CIRCULATION	INTER-LIBRARY LOAN	TOTAL(1) CIRC. (VOLUMES)	PROBABLE REPORTING UNIT	TOTAL(1) CIRC. (COPIES)
OHIO	CINCINNATI	EAST	4,000	1,600		5,600	COPIES	5,600
OHIO	CLEVELAND	EAST	9,400	700		10,100	VOLUMES	4,489
PENNSYLVANIA	PHILADELPHIA	EAST	15,300	1,700		17,000	COPIES	17,000
PUERTO RICO	SAN JUAN	EAST	200	0		200	COPIES	200
RHODE ISLAND	PROVIDENCE	EAST	200			200	COPIES	200
SOUTH CAROLINA	COLUMBIA	EAST	2,000	20		2,020	VOLUMES	898
TENNESSEE	NASHVILLE	EAST	2,900	200		3,100	VOLUMES	1,378
VERMONT	MONTPELIER	EAST	700	70		770	COPIES	770
VIRGIN ISLANDS	ST.CROIX	EAST				0	N/A	0
VIRGINIA	RICHMOND	EAST	1,800	100	400	2,300	COPIES	2,300
WEST VIRGINIA	CHARLESTON	EAST	2,800	40		2,840	COPIES	2,840
WISCONSIN(2)	MILWAUKEE	EAST	2,200	500	60	2,760	VOLUMES	1,227
WISCONSIN(2)	VIA ILLINOIS	EAST	1,300	10		1,310	COPIES	1,310
OVERSEAS	MSCs	BOTH	100		200	300	COPIES	300
		TOTAL	242,400	16,734	9,800	268,934		186,847
					WEST	93,530		66,248
					EAST	175,404		120,598
					WEST	34.8%		35.5%
					EAST	65.2%		64.5%

NOTES-(1) AS REPORTED BY NETWORK REGIONAL LIBRARIES;UNITS COULD DIFFER.

(2) BRAILLE CIRCULATION FROM MORE THAN ONE SOURCE DURING FY91.

APPENDIX 2-5

FY 91 BRAILLE CIRCULATION MULTISTATE CENTERS

STATE	CITY	WEST BR	WEST BRA	WEST PRE-13K BRA	WEST BRJ	WEST BR-MAG	EAST BR	EAST BRA	EAST BRF
ALABAMA	MONTGOMERY			7			7	21	
ALASKA	ANCHORAGE	6							
ARIZONA	PHOENIX								
ARKANSAS	LITTLE ROCK	57	70	46	8				
CALIFORNIA	LOS ANGELES	333	254	36	2	4			52
CALIFORNIA	SACRAMENTO	79	266	48	3	11			4
COLORADO	DENVER	7	5						
CONNECTICUT	ROCKY HILL			1			10	32	
DELAWARE	DOVER			2		1			
DIST.OF COL.	WASHINGTON						8	9	
FLORIDA	DAYTONA BEACH			24	5		20	359	6
GEORGIA	ATLANTA			32	2		103	39	2
HAWAII	HONOLULU	1	6						
IDAHO	BOISE	1							
ILLINOIS	CHICAGO			73	2	1	66	246	5
INDIANA	INDIANAPOLIS						11	58	
IOWA	DES MOINES		90	7					
KANSAS	EMPORIA	86	63	40	2				
KENTUCKY	FRANKFORT			1		1	14	62	
LOUISIANA	BATON ROUGE	12	46	3					
MAINE	AUGUSTA								
MARYLAND	BALTIMORE			17		1	304	90	3
MASSACHUSETTS	WATERTOWN			83	9		60	113	9
MICHIGAN	LANSING			16			8	118	3
MINNESOTA	FARIBAULT	63	96	79	5	2			
MISSISSIPPI	JACKSON						11	24	
MISSOURI	JEFFERSON CY.	4	66	7					
MONTANA	HELENA								
NEBRASKA	LINCOLN								
NEBRASKA	VIA UTAH								
NEVADA	CARSON CITY	1							
NEW HAMPSHIRE	CONCORD						3		
NEW JERSEY	TRENTON			6		1		16	9
NEW MEXICO	SANTA FE					2			
NEW YORK	ALBANY			7	1		1	86	
NEW YORK	NEW YORK			12			166	46	1
NORTH CAROLINA	RALEIGH			2			2	86	
NORTH DAKOTA	GRAND FORKS								
OHIO	CINCINNATI			8	1	1	18	36	1
OHIO	CLEVELAND			19	1	1	193	102	
OKLAHOMA	OKLAHOMA CITY	2	87	26	4				2
OKLAHOMA	VIA UTAH								
OREGON	SALEM	133	76	19					
OVERSEAS	MSCs	266	11	10			4		11
PENNSYLVANIA	PHILADELPHIA			45	5		10	225	10
PUERTO RICO	SAN JUAN				3		3		3

APPENDIX 2-5 (Continued)

STATE	CITY	WEST BR	WEST BRA	WEST PRE-13K BRA	WEST BRJ	WEST BR-MAG	EAST BR	EAST BRA	EAST BRF
RHODE ISLAND	PROVIDENCE			2					
SOUTH CAROLINA	COLUMBIA								
SOUTH DAKOTA	PIERRE								
TENNESSEE	NASHVILLE			8			2	113	1
TEXAS	AUSTIN	10	471	115	2				21
UTAH	SALT LAKE CY.	274	327	184	21	4			3
VERMONT	MONTPELIER								
VIRGIN ISLANDS	ST.CROIX								
VIRGINIA	RICHMOND			47			93	107	18
WASHINGTON	SEATTLE	78	106	40	3				8
WEST VIRGINIA	CHARLESTON			6		6			
WISCONSIN	MILWAUKEE			20	2			118	
WISCONSIN	VIA ILLINOIS								
WYOMING	CHEYENNE								
		1,413	2,040	1,098	81	36	1,117	2,106	172

WEST BR	1,413	EAST BR	1,117
WEST OTI	3,255	EAST OTI	2,278
WEST TO	4,668	EAST TOI	3,395

TOTAL BI	2,530
TOTAL O	5,533
TOTAL T	8,063

PRO FORMA BRAILLE CIRCULATION
(ALL COLLECTIONS)

COLLECTION	NATIONAL TOTAL ANNUAL CIRC. COPIES	AVERAGE VOL./COPY	NATIONAL TOTAL ANNUAL CIRC. VOLUMES	NATIONAL TOTAL DAILY (5) CIRC. COPIES	NATIONAL TOTAL DAILY (5) CIRC. VOLUMES	EAST TOTAL ANNUAL CIRC. COPIES	EAST TOTAL ANNUAL CIRC. VOLUMES	WEST TOTAL ANNUAL CIRC. COPIES	WEST TOTAL ANNUAL CIRC. VOLUMES	EAST TOTAL DAILY(5) CIRC. COPIES	EAST TOTAL DAILY(5) CIRC. VOLUMES	WEST TOTAL DAILY(5) CIRC. COPIES(4)	WEST TOTAL DAILY(5) CIRC. VOLUMES(4)
MAGAZINES	36	1	36	0.1	0.1	24	24	12	12	0.1	0.1	0.0	0.0
BRF	172	2.77	476	0.7	1.9	115	319	57	157	0.5	1.3	0.2	0.6
BRJ	81	6.82	552	0.3	2.2	0	0	81	552	0.0	0.0	0.3	2.2
BRX (3)	20	6.8	136	0.1	0.5	0	0	20	136	0.0	0.0	0.1	0.5
BRA	4,146	6.98	28,939	16.6	115.8	2,806	19,586	1,340	9,353	11.2	78.3	5.4	37.4
PRE-13000 BRA	1,098	5.72	6,281	4.4	25.1	0	0	1,098	6,281	0.0	0.0	4.4	25.1
BRA MASTERS(1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BR	197,087	2.23	439,504	788.3	1,758.0	133,392	297,463	63,695	142,041	533.6	1,189.9	254.8	568.2
TOTAL	202,640 (2)		475,925	811	1,904	136,337	317,393	66,303	158,531	545	1,270	265	634

NOTES: (1) - BRA MASTERS DO NOT CIRCULATE TO PATRONS; UNPREDICTABLE CIRCULATION TO BRAILLE PRODUCERS FOR REPRODUCTION.
(2) - ASSUMPTION: 10 BOOKS (COPIES) PER PATRON PER YEAR.
(3) - BRX CIRCULATION IS ESTIMATED; THE COLLECTION IS NEW AND HAS NO HISTORY.
(4) - THERE IS MAGAZINE CIRCULATION FROM THE WESTEN CENTER,BUT IT IS LESS THAN 0.1 COPIES PER DAY.
(5) - 250 WORKING DAYS PER YEAR.

APPENDIX 2-6

APPENDIX 2-7

FY91 BRAILLE COLLECTION NETWORK LIBRARIES							
(Sorted by Region) STATE	CITY	REGION	REPORTED COLLECTION VOLUMES(1)	REPORTED COLLECTION TITLES	PROBABLE REPORTING UNIT	ADJUSTED/ ESTIMATED COLLECTION VOLUMES(2)	
ARIZONA	PHOENIX	WEST	250	250	COPIES	563	
CALIFORNIA	LOS ANGELES	WEST	19,442	8,994	COPIES	43,745	
CALIFORNIA	SACRAMENTO	WEST	8,734	8,374	COPIES	19,652	
HAWAII	HONOLULU	WEST	18,692	10,859	VOLUMES	18,692	
IOWA	DES MOINES	WEST	66,257	16,547	VOLUMES	66,257	
MINNESOTA	FARIBAULT	WEST	16,000		VOLUMES	16,000	
NEBRASKA	LINCOLN	WEST	402	380	COPIES	905	
OKLAHOMA	OKLAHOMA CITY	WEST	8,674	8,674	COPIES	19,517	
OREGON	SALEM	WEST	10,264	3,950	VOLUMES	10,264	
SOUTH DAKOTA	PIERRE	WEST	586	400	COPIES	1,319	
TEXAS	AUSTIN	WEST	20,634	10,415	COPIES	46,427	
UTAH	SALT LAKE CY.	WEST	33,599	8,558	COPIES	75,598	
WASHINGTON	SEATTLE	WEST	18,996	6,332	VOLUMES	18,996	
**KANSAS	KANSAS CITY	WEST	9,929	4,216	VOLUMES	9,929	
ALABAMA	MONTGOMERY	EAST	25,525	7,679	VOLUMES	25,525	
ARKANSAS	LITTLE ROCK	EAST	7,399	5,857	COPIES	16,648	
CONNECTICUT	ROCKY HILL	EAST	5,578	5,164	COPIES	12,551	
DIST.OF COL.	WASHINGTON	EAST	2,005	604	VOLUMES	2,005	
FLORIDA	DAYTONA BEACH	EAST	77,941	8,758	VOLUMES	77,941	
GEORGIA	ATLANTA	EAST	3,500	1,500	VOLUMES	3,500	
ILLINOIS	CHICAGO	EAST	12,570	7,929	COPIES	28,283	
INDIANA	INDIANAPOLIS	EAST	25,784	8,347	VOLUMES	25,784	
KENTUCKY	FRANKFORT	EAST	17,500	5,300	VOLUMES	17,500	
LOUISIANA	BATON ROUGE	EAST	22,267		VOLUMES	22,267	
MARYLAND	BALTIMORE	EAST	5,612	1,403	VOLUMES	5,612	
MASSACHUSETTS	WATERTOWN	EAST	21,091	8,916	VOLUMES	21,091	
MICHIGAN	LANSING	EAST	20,585	9,467	COPIES	46,316	
MISSISSIPPI	JACKSON	EAST	7,562	3,350	VOLUMES	7,562	
MISSOURI	JEFFERSON CY.	EAST	32,613	8,600	VOLUMES	32,613	
NEW JERSEY	TRENTON	EAST	29,438	7,835	VOLUMES	29,438	
NEW YORK	NEW YORK	EAST	15,771	6,165	VOLUMES	15,771	
NEW YORK	ALBANY	EAST	33,761		VOLUMES	33,761	
NORTH CAROLINA	RALEIGH	EAST	23,100		VOLUMES	23,100	
OHIO	CLEVELAND	EAST	7,359	7,359	COPIES	16,558	
OHIO	CINCINNATI	EAST	20,612	8,441	VOLUMES	20,612	
PENNSYLVANIA	PHILADELPHIA	EAST	33,124	8,700	COPIES	74,529	
PUERTO RICO	SAN JUAN	EAST	450	150	VOLUMES	450	
RHODE ISLAND	PROVIDENCE	EAST	394	335	COPIES	887	
TENNESSEE	NASHVILLE	EAST	24,577	8,332	VOLUMES	24,577	
VIRGINIA	RICHMOND	EAST	14,451	7,949	VOLUMES	14,451	
WISCONSIN	MILWAUKEE	EAST	12,600	5,171	VOLUMES	12,600	
**ALABAMA	TALLADEGA	EAST	7,433	2,530	VOLUMES	7,433	
**WEST VIRGINIA	ROMNEY	EAST	2,870	2,620	COPIES	6,458	
	TOTAL AS REPORTED=		745,931	/TOTAL AS ADJUSTED=		973,681	
		WEST=	232,459	31.2%	WEST=	347,861	35.7%
		EAST=	513,472	68.8%	EAST=	625,821	64.3%

APPENDIX 2-7 (Continued)

1 • NOT ALL LIBRARIES ARE REPORTING VOLUMES AS REQUESTED, SOME ARE REPORTING COPIES.

2 • ADJUSTMENTS TAKE INTO ACCOUNT INFORMATION OBTAINED IN PREVIOUS AND CURRENT STUDIES SITE VISITS, ADDITIONAL INFORMATION ON COLLECTIONS OBTAINED FROM NLS, AND REPORTED TITLE COUNTS. AVERAGE 2.25 VOLUMES/COPY USED FOR ESTIMATION.

APPENDIX 2-8

BR COLLECTION PROFILE				
BR COLLECTION TITLE RANGE	RANGE CODE	SUM OF VOL.	(1) NUM.OF TITLES	AVERAGE VOLUMES PER COPY
BR00001-BR00333	1	624	322	1.94
BR00334-BR00666	2	772	327	2.36
BR00667-BR00999	3	614	300	2.05
BR01000-BR01333	4	688	326	2.11
BR01334-BR01666	5	732	330	2.22
BR01667-BR01999	6	637	328	1.94
BR02000-BR02333	7	626	327	1.91
BR02334-BR02666	8	695	326	2.13
BR02667-BR02999	9	767	329	2.33
BR03000-BR03333	10	618	327	1.89
BR03334-BR03666	11	669	310	2.16
BR03667-BR03999	12	529	252	2.10
BR04000-BR04333	13	760	327	2.32
BR04334-BR04666	14	717	330	2.17
BR04667-BR04999	15	837	333	2.51
BR05000-BR05333	16	764	333	2.29
BR05334-BR05666	17	695	333	2.09
BR05667-BR05999	18	926	331	2.80
BR06000-BR06333	19	783	332	2.36
BR06334-BR06666	20	875	332	2.64
BR06667-BR06999	21	798	332	2.40
BR07000-BR07333	22	713	333	2.14
BR07334-BR07666	23	741	332	2.23
BR07667-BR07999	24	674	331	2.04
BR08000-BR08333	25	762	330	2.31
BR08334-BR08666	26	745	314	2.37
BR08667-BR08999	27	204	87	2.34
BR COLLECTION TITLE RANGE	RANGE CODE	SUM OF VOL.	(1) NUM.OF TITLES	AVERAGE VOLUMES PER COPY
BR00001-BR00999	1-3	2,010	949	2.12
BR01000-BR01999	4-6	2,057	984	2.09
BR02000-BR02999	7-9	2,088	982	2.13
BR03000-BR03999	10-12	1,816	889	2.04
BR04000-BR04999	13-15	2,314	990	2.34
BR05000-BR05999	16-18	2,385	997	2.39
BR06000-BR06999	19-21	2,456	996	2.47
BR07000-BR07999	22-24	2,128	996	2.14
BR08000-BR08999	25-27	1,711	731	2.34
	TOTAL	18,965	8,514	N/A
		AVG. OF TOTALS=		2.23
		AVG. OF AVGS.=		2.23

NOTES:(1) • BASED UPON TOTAL NUMBER OF UNIQUE TITLES IN COMBINED UTAH AND TEXAS FILES.

BR COLLECTION AND CIRCULATION PROFILE
(UTAH REGIONAL LIBRARY)

BR COLLECTION TITLE RANGE	RANGE CODE	UTAH NUM.OF COPIES	UTAH % OF COPIES	UTAH COPIES AVAIL.	UTAH % OF AV.CP.	UTAH COPIES IN CIRC.	UTAH % OF CP. IN CIRC.	UTAH COPIES CIRC.	UTAH % OF CIRC.	UTAH NUM.OF TITLES	UTAH TITLES CIRC.	UTAH % OF TL. CIRC.	UTAH % OF TL RN.CIR.	UTAH AVG.NUM. COP./TIL.	UTAH AVG. CIR/TIL.
BR00001-BR00333	1	461	1.6%	388	1.6%	73	2.0%	130	1.5%	322	52	1.4%	16.1%	1.43	0.40
BR00334-BR00666	2	486	1.7%	423	1.7%	63	1.7%	69	0.8%	327	48	1.3%	14.7%	1.49	0.21
BR00667-BR00999	3	520	1.8%	491	2.0%	29	0.8%	60	0.7%	300	42	1.1%	14.0%	1.73	0.20
BR01000-BR01333	4	650	2.3%	625	2.5%	25	0.7%	88	1.0%	326	45	1.2%	13.8%	1.99	0.27
BR01334-BR01666	5	701	2.5%	666	2.7%	35	1.0%	133	1.5%	330	64	1.8%	19.4%	2.12	0.40
BR01667-BR01999	6	645	2.3%	618	2.5%	27	0.7%	66	0.7%	328	49	1.3%	14.9%	1.97	0.20
BR02000-BR02333	7	497	1.7%	370	1.5%	127	3.5%	827	9.4%	327	258	7.1%	78.9%	1.52	2.53
BR02334-BR02666	8	614	2.2%	534	2.2%	80	2.2%	567	6.4%	326	209	5.7%	64.1%	1.88	1.74
BR02667-BR02999	9	779	2.7%	732	2.9%	47	1.3%	452	5.1%	329	174	4.8%	52.9%	2.37	1.37
BR03000-BR03333	10	922	3.2%	891	3.6%	31	0.9%	581	6.6%	327	190	5.2%	58.1%	2.82	1.78
BR03334-BR03666	11	1,011	3.6%	998	4.0%	13	0.4%	384	4.4%	310	140	3.8%	45.2%	3.26	1.24
BR03667-BR03999	12	830	2.9%	821	3.3%	9	0.2%	244	2.8%	251	108	3.0%	43.0%	3.31	0.97
BR04000-BR04333	13	1,219	4.3%	1,200	4.8%	19	0.5%	310	3.5%	327	142	3.9%	43.4%	3.73	0.95
BR04334-BR04666	14	1,294	4.5%	1,282	5.2%	12	0.3%	259	2.9%	330	115	3.1%	34.8%	3.92	0.78
BR04667-BR04999	15	1,359	4.8%	1,341	5.4%	18	0.5%	200	2.3%	333	102	2.8%	30.6%	4.08	0.60
BR05000-BR05333	16	1,502	5.3%	1,284	5.2%	218	6.0%	447	5.1%	333	161	4.4%	48.3%	4.51	1.34
BR05334-BR05666	17	1,673	5.9%	1,304	5.3%	369	10.2%	306	3.5%	333	139	3.8%	41.7%	5.02	0.92
BR05667-BR05999	18	1,583	5.6%	1,228	4.9%	355	9.8%	218	2.5%	331	127	3.5%	38.4%	4.78	0.66
BR06000-BR06333	19	1,558	5.5%	1,248	5.0%	310	8.6%	348	4.0%	330	172	4.7%	52.1%	4.72	1.05
BR06334-BR06666	20	1,558	5.5%	1,389	5.6%	169	4.7%	276	3.1%	332	156	4.3%	47.0%	4.69	0.83
BR06667-BR06999	21	1,399	4.9%	1,189	4.8%	210	5.8%	342	3.9%	332	173	4.7%	52.1%	4.21	1.03
BR07000-BR07333	22	1,562	5.5%	1,260	5.1%	302	8.3%	524	5.9%	333	216	5.9%	64.9%	4.69	1.57
BR07334-BR07666	23	1,465	5.2%	1,198	4.8%	267	7.4%	427	4.8%	332	201	5.5%	60.5%	4.41	1.29
BR07667-BR07999	24	1,420	5.0%	1,186	4.8%	234	6.5%	474	5.4%	331	204	5.6%	61.6%	4.29	1.43
BR08000-BR08333	25	1,286	4.5%	1,084	4.4%	202	5.6%	695	7.9%	330	232	6.3%	70.3%	3.90	2.11
BR08334-BR08666	26	1,274	4.5%	993	4.0%	281	7.8%	376	4.3%	313	133	3.6%	42.5%	4.07	1.20
BR08667-BR08999	27	175	0.6%	78	0.3%	97	2.7%	6	0.1%	33	3	0.1%	9.1%	5.30	0.18

BR COLLECTION TITLE RANGE	RANGE CODE	UTAH NUM.OF COPIES	UTAH % OF COPIES	UTAH COPIES AVAIL.	UTAH % OF AV.CP.	UTAH COPIES IN CIRC.	UTAH % OF CP. IN CIRC.	UTAH COPIES CIRC.	UTAH % OF CIRC.	UTAH NUM.OF TITLES	UTAH TITLES CIRC.	UTAH % OF TL. CIRC.	UTAH % OF TL RN.CIR.	UTAH AVG.NUM. COP./TIL.	UTAH AVG. CIR/TIL.
BR00001-BR00999	1-3	1,467	5.2%	1,302	5.2%	165	4.6%	259	2.9%	949	142	3.9%	15.0%	1.55	0.27
BR01000-BR01999	4-6	1,996	7.0%	1,909	7.7%	87	2.4%	287	3.3%	984	158	4.3%	16.1%	2.03	0.29
BR02000-BR02999	7-9	1,890	6.6%	1,636	6.6%	254	7.0%	1,846	21.0%	982	641	17.5%	65.3%	1.92	1.88
BR03000-BR03999	10-12	2,763	9.7%	2,710	10.9%	53	1.5%	1,209	13.7%	888	438	12.0%	49.3%	3.11	1.36
BR04000-BR04999	13-15	3,872	13.6%	3,823	15.4%	49	1.4%	769	8.7%	990	359	9.8%	36.3%	3.91	0.78
BR05000-BR05999	16-18	4,758	16.7%	3,816	15.4%	942	26.0%	971	11.0%	997	427	11.7%	42.8%	4.77	0.97
BR06000-BR06999	19-21	4,515	15.9%	3,826	15.4%	689	19.0%	966	11.0%	994	501	13.7%	50.4%	4.54	0.97
BR07000-BR07999	22-24	4,447	15.6%	3,644	14.7%	803	22.2%	1,425	16.2%	996	621	17.0%	62.3%	4.46	1.43
BR08000-BR08999	25-27	2,735	9.6%	2,155	8.7%	580	16.0%	1,077	12.2%	676	368	10.1%	54.4%	4.05	1.59
	TOTAL	28,443	100.0%	24,821	100.0%	3,622	100.0%	8,809	100.0%	8,456	3,655	100.0%	N/A	3.36	1.04

(1) - REPORT DATE 5/22/92; CIRCULATION PERIOD 10/1/91 TO 5/22/92 (APPROX. 8 MONTHS).

BR COLLECTION AND CIRCULATION PROFILE
(TEXAS REGIONAL LIBRARY)

BR COLLECTION TITLE RANGE	RANGE CODE	TEXAS NUM.OF COPIES	TEXAS % OF COPIES	TEXAS COPIES AVAIL.	TEXAS % OF AV.CP.	TEXAS COPIES IN CIRC.	TEXAS % OF CP. IN CIRC.	TEXAS COPIES CIRC.	TEXAS % OF CIRC.	TEXAS NUM.OF TITLES	TEXAS TITLES CIRC.	TEXAS % OF TL. CIRC.	TEXAS % OF TL RN.CIR.	TEXAS AVG.NUM. COP./TIL.	TEXAS AVG. CIR/TIL.
BR00001-BR00333	1	372	2.2%	286	2.2%	86	2.2%	36	0.7%	304	23	1.0%	7.6%	1.22	0.12
BR00334-BR00666	2	392	2.3%	310	2.4%	82	2.1%	38	0.7%	313	26	1.1%	8.3%	1.25	0.12
BR00667-BR00999	3	379	2.2%	269	2.1%	110	2.8%	44	0.9%	293	35	1.5%	11.9%	1.29	0.15
BR01000-BR01333	4	461	2.7%	288	2.2%	173	4.4%	58	1.1%	316	37	1.6%	11.7%	1.46	0.18
BR01334-BR01666	5	424	2.5%	300	2.3%	124	3.1%	63	1.2%	317	39	1.7%	12.3%	1.34	0.20
BR01667-BR01999	6	466	2.7%	327	2.5%	139	3.5%	64	1.3%	325	49	2.1%	15.1%	1.43	0.20
BR02000-BR02333	7	491	2.9%	323	2.5%	168	4.3%	64	1.3%	323	47	2.0%	14.6%	1.52	0.20
BR02334-BR02666	8	511	3.0%	329	2.5%	182	4.6%	52	1.0%	317	36	1.5%	11.4%	1.61	0.16
BR02667-BR02999	9	548	3.2%	425	3.2%	123	3.1%	54	1.1%	320	38	1.6%	11.9%	1.71	0.17
BR03000-BR03333	10	582	3.4%	547	4.2%	35	0.9%	92	1.8%	324	61	2.6%	18.8%	1.80	0.28
BR03334-BR03666	11	547	3.2%	416	3.2%	131	3.3%	97	1.9%	309	61	2.6%	19.7%	1.77	0.31
BR03667-BR03999	12	440	2.6%	357	2.7%	83	2.1%	87	1.7%	251	52	2.2%	20.7%	1.75	0.35
BR04000-BR04333	13	579	3.4%	444	3.4%	135	3.4%	105	2.1%	315	65	2.8%	20.6%	1.84	0.33
BR04334-BR04666	14	658	3.9%	468	3.6%	190	4.8%	160	3.1%	329	83	3.5%	25.2%	2.00	0.49
BR04667-BR04999	15	674	3.9%	491	3.7%	183	4.6%	101	2.0%	331	59	2.5%	17.8%	2.04	0.31
BR05000-BR05333	16	867	5.1%	588	4.5%	279	7.1%	168	3.3%	331	110	4.7%	33.2%	2.62	0.51
BR05334-BR05666	17	687	4.0%	450	3.4%	237	6.0%	222	4.4%	332	123	5.2%	37.0%	2.07	0.67
BR05667-BR05999	18	685	4.0%	464	3.5%	221	5.6%	101	2.0%	330	69	2.9%	20.9%	2.08	0.31
BR06000-BR06333	19	751	4.4%	587	4.5%	164	4.2%	181	3.6%	329	95	4.0%	28.9%	2.28	0.55
BR06334-BR06666	20	739	4.3%	535	4.1%	204	5.2%	222	4.4%	331	127	5.4%	38.4%	2.23	0.67
BR06667-BR06999	21	691	4.0%	551	4.2%	140	3.5%	248	4.9%	332	133	5.7%	40.1%	2.08	0.75
BR07000-BR07333	22	732	4.3%	564	4.3%	168	4.3%	441	8.7%	330	188	8.0%	57.0%	2.22	1.34
BR07334-BR07666	23	1,119	6.6%	1,027	7.8%	92	2.3%	555	10.9%	332	214	9.1%	64.5%	3.37	1.67
BR07667-BR07999	24	1,186	7.0%	986	7.5%	200	5.1%	670	13.2%	331	200	8.5%	60.4%	3.58	2.02
BR08000-BR08333	25	953	5.6%	780	5.9%	173	4.4%	759	14.9%	330	232	9.9%	70.3%	2.89	2.30
BR08334-BR08666	26	915	5.4%	805	6.1%	110	2.8%	389	7.6%	310	142	6.0%	45.8%	2.95	1.25
BR08667-BR08999	27	215	1.3%	202	1.5%	13	0.3%	18	0.4%	39	6	0.3%	15.4%	5.51	0.46

BR COLLECTION TITLE RANGE	RANGE CODE	TEXAS NUM.OF COPIES	TEXAS % OF COPIES	TEXAS COPIES AVAIL.	TEXAS % OF AV.CP.	TEXAS COPIES IN CIRC.	TEXAS % OF CP. IN CIRC.	TEXAS COPIES CIRC.	TEXAS % OF CIRC.	TEXAS NUM.OF TITLES	TEXAS TITLES CIRC.	TEXAS % OF TL. CIRC.	TEXAS % OF TL RN.CIR.	TEXAS AVG.NUM. COP./TIL.	TEXAS AVG. CIR/TIL.
BR00001-BR00999	1-3	1,143	6.7%	865	6.6%	278	7.0%	118	2.3%	910	84	3.6%	9.2%	1.26	0.13
BR01000-BR01999	4-6	1,351	7.9%	915	7.0%	436	11.1%	185	3.6%	958	125	5.3%	13.0%	1.41	0.19
BR02000-BR02999	7-9	1,550	9.1%	1,077	8.2%	473	12.0%	170	3.3%	960	121	5.1%	12.6%	1.61	0.18
BR03000-BR03999	10-12	1,569	9.2%	1,320	10.1%	249	6.3%	276	5.4%	884	174	7.4%	19.7%	1.77	0.31
BR04000-BR04999	13-15	1,911	11.2%	1,403	10.7%	508	12.9%	366	7.2%	975	207	8.8%	21.2%	1.96	0.38
BR05000-BR05999	16-18	2,239	13.1%	1,502	11.4%	737	18.7%	491	9.6%	993	302	12.9%	30.4%	2.25	0.49
BR06000-BR06999	19-21	2,181	12.8%	1,673	12.8%	508	12.9%	651	12.8%	992	355	15.1%	35.8%	2.20	0.66
BR07000-BR07999	22-24	3,037	17.8%	2,577	19.6%	460	11.7%	1,666	32.7%	993	602	25.6%	60.6%	3.06	1.68
BR08000-BR08999	25-27	2,083	12.2%	1,787	13.6%	296	7.5%	1,166	22.9%	679	380	16.2%	56.0%	3.07	1.72
	TOTAL	17,064	100.0%	13,119	100.0%	3,945	100.0%	5,089	100.0%	8,344	2,350	100.0%	N/A	2.05	0.61

(1) - REPORT DATE 6/30/92; CIRCULATION PERIOD 9/1/91 TO 6/30/92 (APPROX. 10 MONTHS).

APPENDIX 2-11

CURRENT NLS BRAILLE COLLECTIONS							
COLLECTION	CURRENT LOCATION	CURRENT NUMBER OF TITLES	CURRENT NUMBER OF COP./TIL.	CURRENT NUMBER OF COPIES	CURRENT NUMBER OF VOLUMES	AVERAGE NUMBER OF VOLUMES PER COPY	AVERAGE NUMBER OF VOLUMES PER LF
BR(1)	40 RLs,3 SRLs,2 MSCs	8,547	60 AVG.	462,269	1,030,860	2.23	4
BRA(2)	2 MSCs	5,000	3	15,000	104,700	6.98	5
BRF(3)	MSCE	1,524	3 AVG.	4,572	12,664	2.77	6
BRA MASTERS(4)	MSCW	4,307	1	4,307	30,063	6.98	4.7
BRA PRE-13,000 (5)	MSCW	11,000	1	11,000	62,920	5.72	4.7
BRJ (6)	MSCW	2,462	1	2,462	16,791	6.82	4.7
BRX(7)	MSCW	450	1	450	3,060	6.8	4.7
MAGAZINES,B.I.(8)	MSCW	0	4	0	0	1	12
TOTALS		33,290		500,060	1,261,059		

NOTES

(1) CURRENT COLLECTION SIZE BASED UPON NETWORK LIBRARY AND MSC REPORTED COLLECTIONS.

(2) CURRENTLY TWO SETS AT MSCE AND ONE SET AT MSCW.

(3) CURRENTLY ALL AT MSCE.

(4) NON-CIRCULATING TO PATRONS. CURRENTLY AT MSCW.

(5) CURRENTLY AT MSCW.

(6) CURRENTLY AT MSCW.

(7) NEW COLLECTION COMING INTO MSCW. AVERAGE VOLUMES PER COPY ESTIMATED..

(8) CURRENTLY AT MSCW.

TOTAL OF 31 PERIODICALS MAINTAINED. APPROXIMATELY 5-YR AVERAGE COLLECTION DEPTH.

BRAILLE MAGAZINE ARCHIVE COLLECTION (1 COPY PER ISSUE) WILL NOT BE STORED IN BRAILLE CENTERS.

APPENDIX 2-12

PRO FORMA ALLOCATION OF COLLECTIONS						
COLLECTION	PRO FORMA WESTERN CENTER (TITLES)	PRO FORMA WESTERN CENTER (COPIES)	PRO FORMA WESTERN CENTER (VOLUMES)	PRO FORMA EASTERN CENTER (TITLES)	PRO FORMA EASTERN CENTER (COPIES)	PRO FORMA EASTERN CENTER (VOLUMES)
BR(1)	8,547	157,172	350,493	8,547	305,098	680,368
BRA(2)	5,000	5,000	34,900	5,000	10,000	69,800
BRF(3)	1,524	1,524	4,221	1,524	3,048	8,443
BRA MASTERS(4)	4,307	4,307	30,063	0	0	0
BRA PRE-13,000 (5)	11,000	11,000	62,920	0	0	0
BRJ (6)	2,462	2,462	16,791	0	0	0
BRX(7)	450	450	3,060	0	0	0
MAGAZINES,B.I.(8)	0	0	0	0	0	0
TOTALS	33,290	181,915	502,448	15,071	318,146	758,611

NOTES

(1) CURRENT COLLECTION SIZE BASED UPON NETWORK LIBRARY AND MSC REPORTED COLLECTIONS.
PRO FORMA 34% WEST,66 % EAST.

(2) CURRENTLY TWO SETS AT MSCE AND ONE SET AT MSCW;SAME PRO FORMA.

(3) CURRENTLY ALL AT MSCE; PRO FORMA SHIFTS 1/3 OF COLLECTION TO MSCW.

(4) NON-CIRCULATING TO PATRONS. CURRENTLY AT MSCW;SAME PRO FORMA.

(5) CURRENTLY AT MSCW; SAME PRO FORMA.

(6) CURRENTLY AT MSCW; SAME PRO FORMA.

(7) NEW COLLECTION COMING INTO MSCW;SAME PRO FORMA. AVERAGE VOLUMES PER COPY ESTIMATED.

(8) CURRENTLY AT MSCW; PRO FORMA SHIFTS 2 OF 4 SETS TO THE EAST.
TOTAL OF 31 PERIODICALS MAINTAINED. APPROXIMATELY 5-YR AVERAGE COLLECTION DEPTH.
BRAILLE MAGAZINE ARCHIVE COLLECTION (1 COPY PER ISSUE) WILL NOT BE STORED IN BRAILLE CENTERS.

PRO FORMA COLLECTION PROFILE										
COLLECTION	PRO FORMA WESTERN CENTER (COPIES IN FLOAT)	PRO FORMA WESTERN CENTER (VOLUMES IN FLOAT)	PRO FORMA EASTERN CENTER (COPIES IN FLOAT)	PRO FORMA EASTERN CENTER (VOLUMES IN FLOAT)	PRO FORMA WESTERN CENTER (COPIES IN HOUSE)	PRO FORMA WESTERN CENTER (VOLUMES IN HOUSE)	PRO FORMA EASTERN CENTER (COPIES IN HOUSE)	PRO FORMA EASTERN CENTER (VOLUMES IN HOUSE)	PRO FORMA WESTERN CENTER SHELVING (IN LF)	PRO FORMA EASTERN CENTER SHELVING (IN LF)
BR(1)	26,196	58,417	54,860	122,338	130,976	292,075	250,238	558,030	73,019	139,508
BRA(2)	684	4,775	1,389	9,695	4,316	30,125	8,611	60,105	6,025	12,021
BRF(3)	28	79	58	160	1,496	4,143	2,990	8,283	690	1,381
BRA MASTERS(4)	0	0	0	0	4,307	30,063	0	0	6,396	0
BRA PRE-13,000 (5)	549	3,140	0	0	10,451	59,780	0	0	12,719	0
BRJ (6)	41	276	0	0	2,422	16,515	0	0	3,514	0
BRX(7)	10	68	0	0	440	2,992	0	0	637	0
MAGAZINES,B.I.(8)	6	6	12	12	(6)	(6)	(12)	(12)	(0)	(1)
TOTALS	**27,514**	**66,761**	**56,319**	**132,204**	**154,401**	**435,687**	**261,827**	**626,407**	**103,000**	**152,908**

NOTES
(1) CURRENT COLLECTION SIZE BASED UPON NETWORK LIBRARY AND MSC REPORTED COLLECTIONS. PRO FORMA 34% WEST,66 % EAST.
(2) CURRENTLY TWO SETS AT MSCE AND ONE SET AT MSCW;SAME PRO FORMA.
(3) CURRENTLY ALL AT MSCE; PRO FORMA SHIFTS 1/3 OF COLLECTION TO MSCW.
(4) NON-CIRCULATING TO PATRONS. CURRENTLY AT MSCW;SAME PRO FORMA.
(5) CURRENTLY AT MSCW; SAME PRO FORMA.
(6) CURRENTLY AT MSCW; SAME PRO FORMA.
(7) NEW COLLECTION COMING INTO MSCW;SAME PRO FORMA. AVERAGE VOLUMES PER COPY ESTIMATED.
(8) CURRENTLY AT MSCW; PRO FORMA SHIFTS 2 OF 4 SETS TO THE EAST.
TOTAL OF 31 PERIODICALS MAINTAINED. APPROXIMATELY 5-YR AVERAGE COLLECTION DEPTH.
BRAILLE MAGAZINE ARCHIVE COLLECTION (1 COPY PER ISSUE) WILL NOT BE STORED IN BRAILLE CENTERS.

APPENDIX 2-13

BEST COPY AVAILABLE

APPENDIX 2-14
TELEPHONE TRAFFIC ANALYSIS

(1) Based Upon Utah RL Data (Out-of-State Braille Patrons, less Wyoming)

Number of Days = 63
Number of Calls = 683
Number of Calls/Day = 10.84
Average Duration = 2.99 minutes
Standard Deviation = 3.27 minutes
Number of Patrons = 691
Number of National Patrons = 20,264

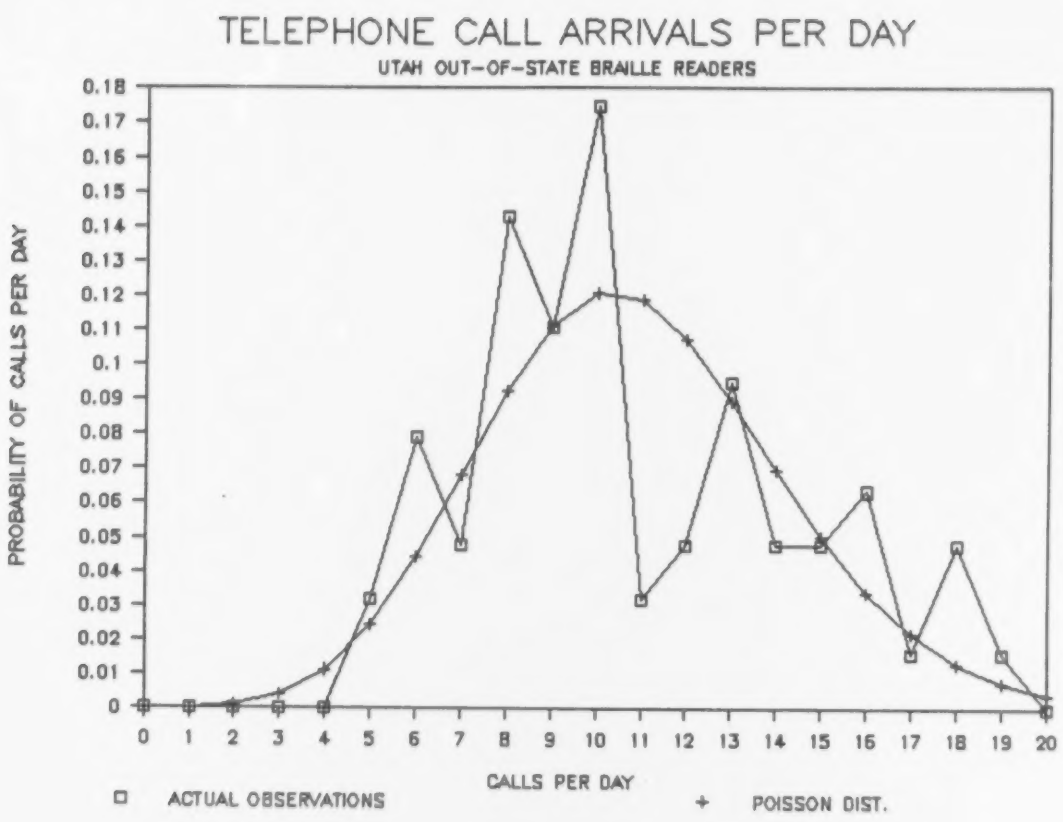
(10.8 Calls/Day) x (20,264/691) = 317 Calls/Day

(2) Baseline Estimation of Telephone Traffic

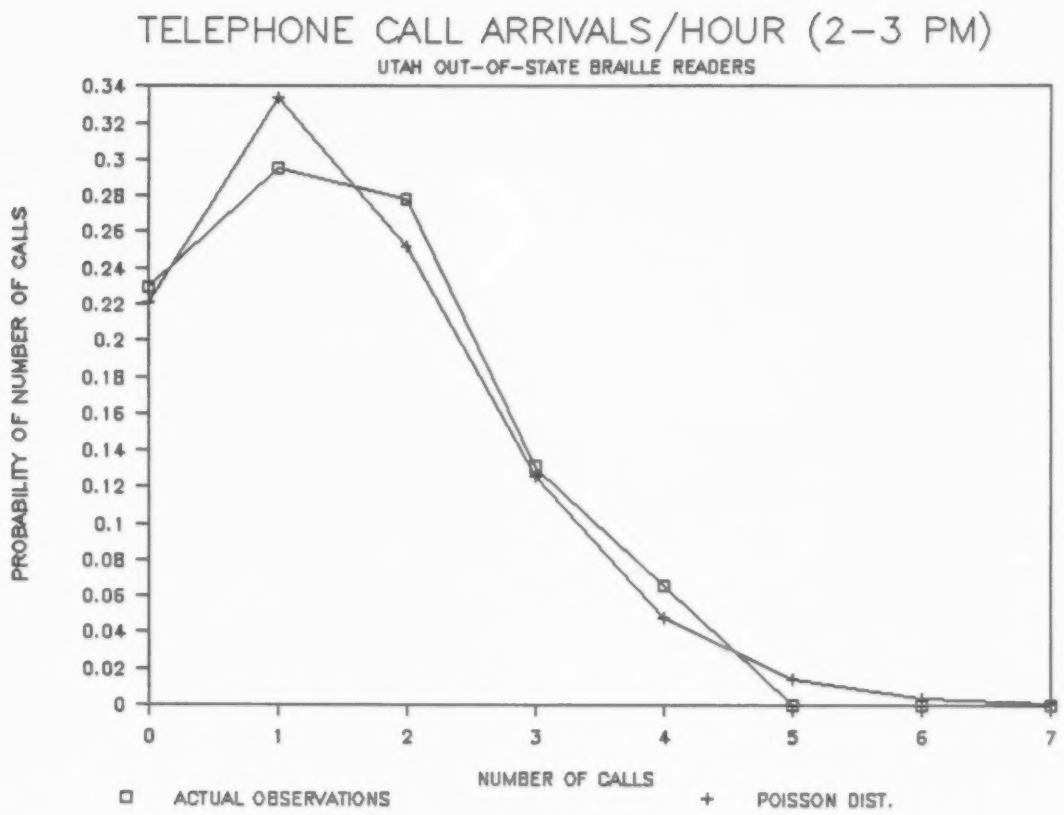
Number of National Patrons = 20,264
Average Circulation = 10 Books/Patron/Year
Percent of Circulation Via Telephone Request = 40% (55%-Auto Select, 5%-Mail)
Average Number of Books Ordered/Call = 1.0
Number of Working Days/Year = 250

20,264 Patrons x (10 Orders/Patron/Year) x (0.4 Calls/Order) x (Year/250 Days) = 324 Calls/Day

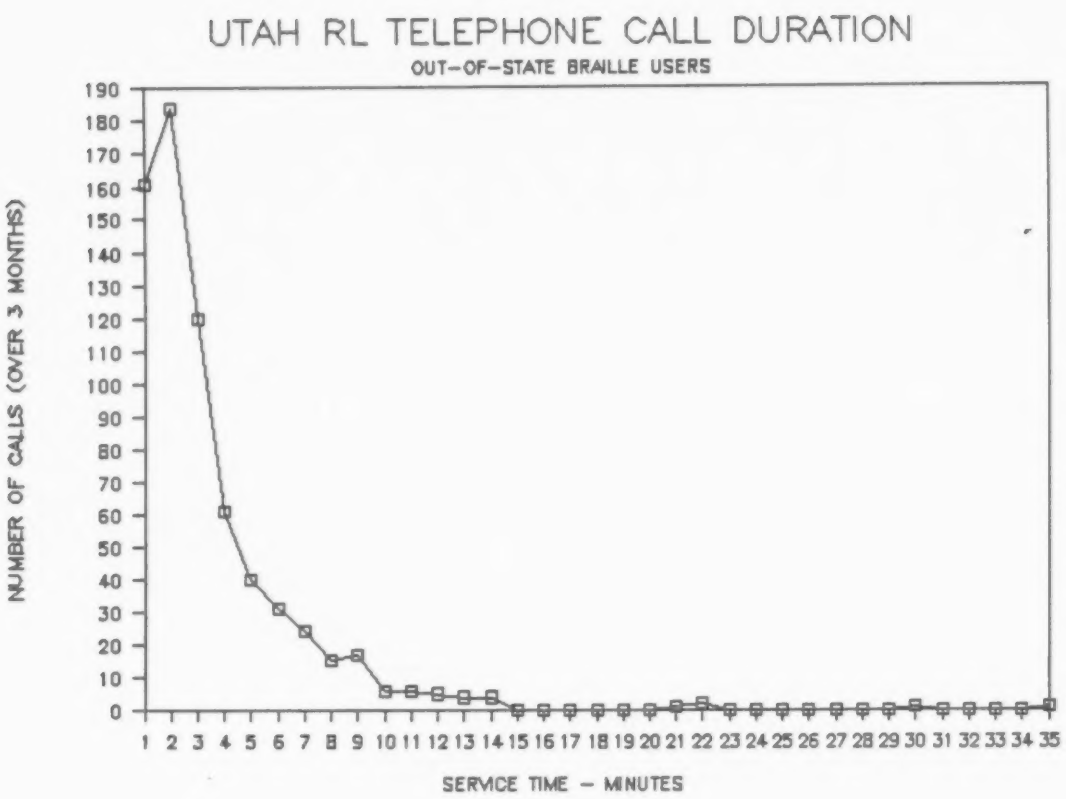
APPENDIX 2-15



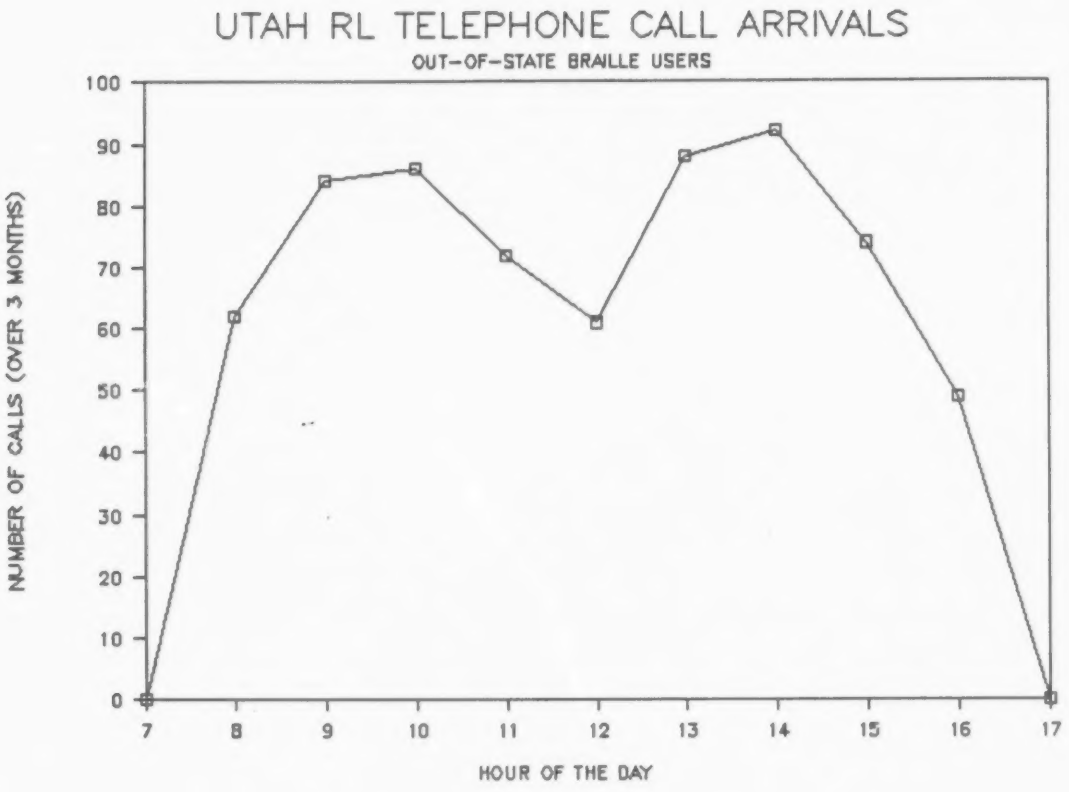
APPENDIX 2-16



APPENDIX 2-17



APPENDIX 2-18



APPENDIX 2-19
PHONE RECEPTION REQUIREMENTS ANALYSIS

Design Parameters

Average Daily Traffic: 325 calls
Average Call Duration: 3.0 minutes
Poisson Arrivals
Exponential Service Times
Bimodal Peaks
Peak Hour is 2:00PM - 3:00PM
% of Daily Traffic = 13.5%
Calls/Hour = 44 calls/hour

Measurement	Number of Receptionists/RA's (Option A)			
	3	4	5	6
Average Queue Length	1.49 calls	0.27 calls	0.06 calls	0.016 calls
Probability of Waiting	54.2%	22.6%	8.3%	2.8%
Mean Waiting Time	121.8 sec	22.6 sec	5.3 sec	1.3 sec
Utilization of Receptionists, Peak	73.3%	55%	44%	36.6%
Utilization of Receptionists, Day (8 hr day/7.5 hr day)	67.7%/72.2%	50.7%/54.1%	40.6%/43.3%	33.8%/36.1%

April 29, 1992
Version 9.0

SPECIFICATION FOR THE ZIP CODE BAR CODE SYMBOL

1. SCOPE

1.1 Scope - This specification covers the requirement for the ZIP Code Bar Code Symbol that is placed on packages destined for processing through USPS Bulk Mail Centers (BMC). The ZIP Code information is read by the USPS Package Bar Coding System. The ZIP Code data is then used to sort the package to its destination. The symbol construction is based on AIM Uniform Symbology Specifications: USS-I 2/5, USS39 and USS128. These codes are the only ones allowed. All requirements not specified in this specification, e.g., tolerances, are to follow these AIM specifications.

2. APPLICABLE DOCUMENTS

Uniform Symbology Specification, USS-I 2/5, AIM.

Uniform Symbology Specification, USS-39, AIM.

Uniform Symbology Specification, USS-128, AIM.

(Copies of the above specifications can be obtained from AIM - Automatic Identification Manufacturers, A Product Section of the Material Handling Institute, Inc., 1326 Freeport Rd., Pittsburgh, PA 15238)

3. LABEL CHARACTERISTICS

3.1 Human-Readable Characters - The printing of human-readable characters representing the bar code symbol is optional. The only requirement is that the characters not be printed in the symbols clear zone. Also, the Verifier character not be printed as part of the human-readable ZIP Code. Many packages have bar code symbols that do not represent the ZIP Code, but are used by our Customers for their internal processing. These codes could confuse the BMC keying operation and force the operator to key the ZIP Code. This reduces throughput. It is, therefore, strongly recommended that the label contain human-readable text identifying the symbol as a ZIP Code. For example "ZIP" could be printed near the symbol. Then this will identify the package for automated processing.

4. SYMBOL CHARACTERISTICS

4.1 Format - The ZIP Code bar code symbol contains six digits and has two fields. One field is for the five digit ZIP Code and the other is a single digit field referred to as the Verifier.

4.2 Character Sets - The character set and the Bar Code used are: Interleaved Two of Five (USS-I 2/5), Code Three of Nine (USS-39), or Code 128 (USS-128) . The detailed specifications of the code is defined in the AIM Specifications.

4.3 Symbol Orientation - The preferred position of the bars of the symbol is that they be perpendicular to the line of type of the address and that the symbol be located on the address label. However, the symbol may be located anywhere on the same surface of the package as the address label.

4.4 Dimensions - The Bar Code Symbol shall meet the following dimensional requirements.

4.4.1 Width - The preferred narrow bar or space width is 0.015 inches and the preferred wide bar or space width is 0.030 inches. However, any narrow bar dimension greater than 0.013 inches is allowed.

4.4.2 Inter-character Gap - If Code Three of Nine is used the inter-character gap must be equal to the narrow bar width.

4.4.3 Ratio - The ratio of wide bar to narrow bar can have two different ranges. They are:

4.4.3.1 Single Symbol - Provided the label surface of the package has only one six digit bar code symbol. The ratio for Interleaved Two of Five and Code Three of Nine symbols can be within the range 1.9:1 through 3.2:1.

4.4.3.2 Multiple Symbols - If there is more than one six digit bar code symbol on the label surface the ratio must be within the range 1.9:1 through 2.2:1 (nominal value 2:1). This ratio is required to identify the ZIP Code symbol.

4.4.4 Height - The height of the bar should be greater than 0.75 inches.

4.4.5 Clear Zone - The minimum clear zone dimension, that is the distance before, after, above and below the bar code symbol shall be greater than 0.125 inches.

4.5 Print Reflectance

4.5.1 Print Reflectance Difference (PRD) - The minimum acceptable value is 35%.

4.5.2 Maximum Black Bar Reflectance (Rb) - Rb shall be less than 30%.

4.5.3 Minimum White Bar (Space) Reflectance (Rs) - Rs shall be greater than 25%.

4.5.4 Measurements - All reflectance shall be measured with respect to the black and white surface standards in the standard spectral band.

4.5.4.1 The measurements of reflectance of the bars and spaces are used to determine PRD using the following equation:

PRD = Rs - Rb

where:

Rs is the reflectance of the bar space measured with respect to a white surface standard (in percent), and

Rb is the reflectance of the bar measured with respect to a black surface standard (in percent).

4.5.4.2 The white surface standard is pressed Barium Sulfate ($BaSO_4$) or Magnesium Oxide (MgO).

4.5.4.3 The black surface standard is carbon black or any black material which has a less than 1% reflectance.

4.5.5 Standard Optical Spectral Band - The spectral band used by the Package Bar Code System to measure bar code symbols is the red spectrum, centered at 633 nanometers $^{+}/_{-}$ 5 percent and having a half-power band width no greater than 120 nanometers.

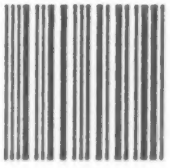
4.6 Verifier Determination - The Verifier is to appear as the last character of the ZIP Code symbol. The Verifier character is nine (9). That is, the last digit of the ZIP Code symbol should always be a nine. If the ZIP Code is 22082 then the bar code symbol would be printed using 220829. Note: Any human readable text should not contain the Verifier number nine. Only the ZIP Code 22082 should be printed.

APPENDIX 2-20 (Continued)

PACKAGE LABELS

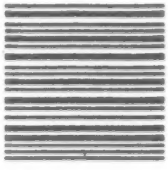
RETURN ADDRESS
1234 STREET NAME
ANYTOWN, USA 00000-0000

DELIVERY ADDRESS
1234 STREET NAME
ANYTOWN, USA 00000-0000



RETURN ADDRESS
1234 STREET NAME
ANYTOWN, USA 00000-0000

DELIVERY ADDRESS
1234 STREET NAME
ANYTOWN, USA 00000-0000

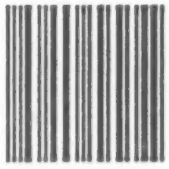


APPENDIX 2-20 (Continued)

PACKAGE LABELS

RETURN ADDRESS
1234 STREET NAME
ANYTOWN, USA 00000-0000

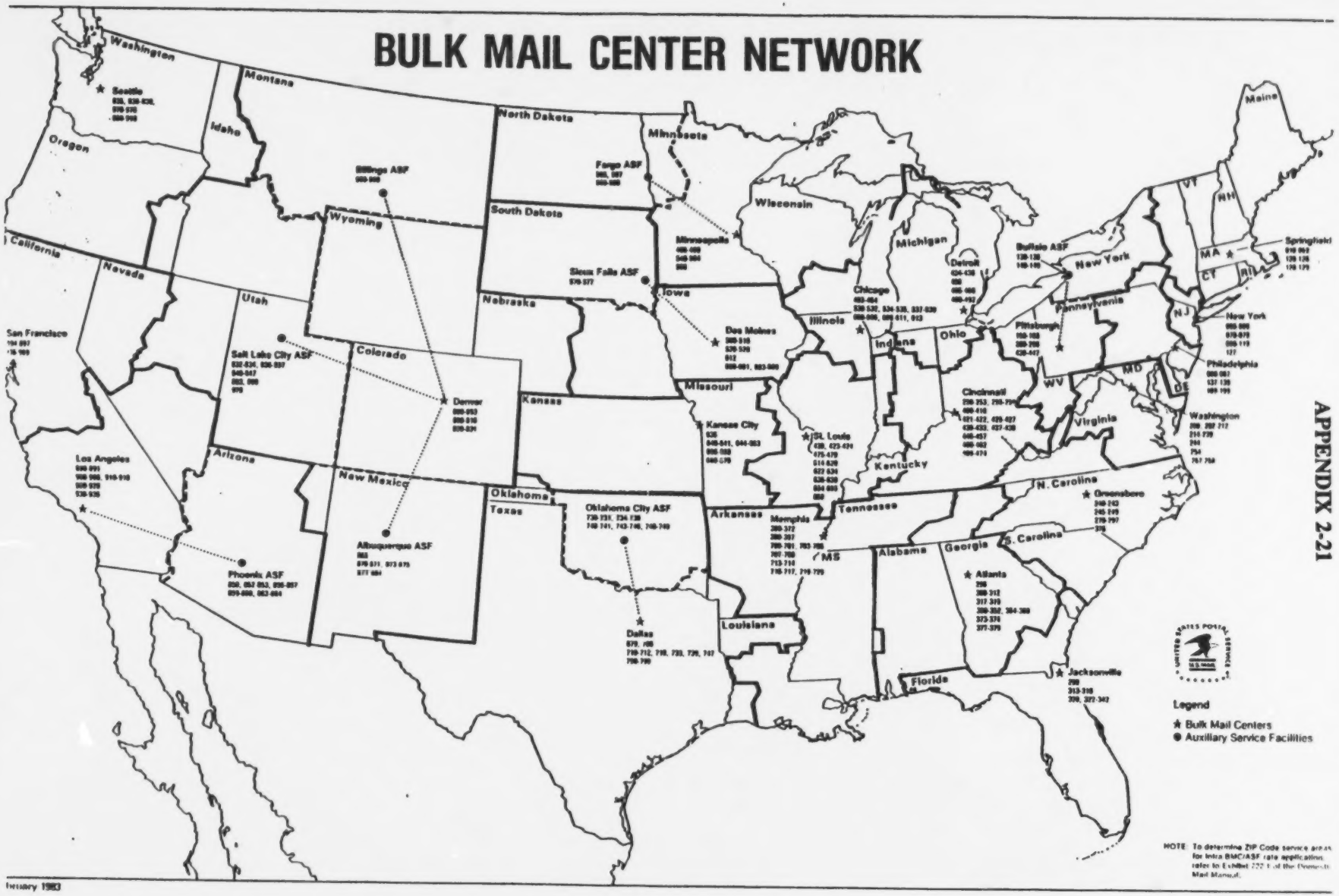
DELIVERY ADDRESS
1234 STREET NAME
ANYTOWN, USA 00000-0000



RETURN ADDRESS
1234 STREET NAME
ANYTOWN, USA 00000-0000

DELIVERY ADDRESS
1234 STREET NAME
ANYTOWN, USA 00000-0000

BULK MAIL CENTER NETWORK



APPENDIX 2-21

APPENDIX 2-22
USPS PARCEL POST DELIVERY TIMES
BASED UPON USPS STANDARDS AND CURRENT PERFORMANCE

SAME BMC/ASF ZONE

ACTUAL DELIVERY TIME (DAYS)	PERCENT OF TOTAL VOLUME	WEIGHTED TIME (DAYS)	WEIGHTED SQUARED DEVIATION (DAYS^2)
2	70.00%	1.40	0.61
3	10.00%	0.30	0.00
4	5.00%	0.20	0.06
5	5.00%	0.25	0.21
6	3.35%	0.20	0.32
7	2.25%	0.16	0.37
8	1.51%	0.12	0.39
9	1.01%	0.09	0.37
10	0.68%	0.07	0.34
11	0.46%	0.05	0.30
12	0.31%	0.04	0.25
13	0.20%	0.03	0.21
14	0.14%	0.02	0.17
15	0.09%	0.01	0.13
TOTAL PERCENT=	100.00%		
AVERAGE TIME=		2.93 DAYS	
VARIANCE=			3.72 DAYS^2
STANDARD DEVIATION=			1.93 DAYS

ONE(1) BMC/ASF ZONE OUT

ACTUAL DELIVERY TIME (DAYS)	PERCENT OF TOTAL VOLUME	WEIGHTED TIME (DAYS)	WEIGHTED SQUARED DEVIATION (DAYS^2)
2	0.00%	0.00	0.00
3	70.00%	2.10	0.60
4	10.00%	0.40	0.00
5	5.00%	0.25	0.06
6	5.00%	0.30	0.21
7	3.36%	0.24	0.32
8	2.26%	0.18	0.38
9	1.52%	0.14	0.39
10	1.03%	0.10	0.38
11	0.69%	0.08	0.34
12	0.46%	0.06	0.30
13	0.31%	0.04	0.26
14	0.21%	0.03	0.21
15	0.14%	0.02	0.17
TOTAL PERCENT=	100.00%		
AVERAGE TIME=		3.93 DAYS	
VARIANCE=			3.63 DAYS^2
STANDARD DEVIATION=			1.91 DAYS

APPENDIX 2-22
(CONTINUED)

TWO(2) BMC/ASF ZONES OUT

ACTUAL DELIVERY TIME (DAYS)	PERCENT OF TOTAL VOLUME	WEIGHTED TIME (DAYS)	WEIGHTED SQUARED DEVIATION (DAYS^2)
2	0.00%	0.00	0.00
3	0.00%	0.00	0.00
4	70.00%	2.80	0.60
5	10.00%	0.50	0.00
6	5.00%	0.30	0.06
7	5.00%	0.35	0.22
8	3.38%	0.27	0.32
9	2.29%	0.21	0.38
10	1.55%	0.15	0.40
11	1.05%	0.12	0.39
12	0.71%	0.09	0.36
13	0.48%	0.06	0.31
14	0.32%	0.05	0.27
15	0.22%	0.03	0.22

TOTAL PERCENT= 100.00%
AVERAGE TIME= 4.92 DAYS
VARIANCE= 3.52 DAYS^2
STANDARD DEVIATION= 1.88 DAYS

THREE(3) BMC/ASF ZONES OUT

ACTUAL DELIVERY TIME (DAYS)	PERCENT OF TOTAL VOLUME	WEIGHTED TIME (DAYS)	WEIGHTED SQUARED DEVIATION (DAYS^2)
2	0.00%	0.00	0.00
3	0.00%	0.00	0.00
4	0.00%	0.00	0.00
5	70.00%	3.50	0.58
6	10.00%	0.60	0.00
7	5.00%	0.35	0.06
8	5.00%	0.40	0.22
9	3.41%	0.31	0.33
10	2.33%	0.23	0.39
11	1.59%	0.17	0.41
12	1.08%	0.13	0.40
13	0.74%	0.10	0.37
14	0.50%	0.07	0.33
15	0.34%	0.05	0.28

TOTAL PERCENT= 100.00%
AVERAGE TIME= 5.91 DAYS
VARIANCE= 3.37 DAYS^2
STANDARD DEVIATION= 1.84 DAYS

APPENDIX 2-22
(CONTINUED)

FOUR(4) BMC/ASF ZONES OUT

ACTUAL DELIVERY TIME (DAYS)	PERCENT OF TOTAL VOLUME	WEIGHTED TIME (DAYS)	WEIGHTED SQUARED DEVIATION (DAYS^2)
2	0.00%	0.00	0.00
3	0.00%	0.00	0.00
4	0.00%	0.00	0.00
5	0.00%	0.00	0.00
6	70.00%	4.20	0.57
7	10.00%	0.70	0.00
8	5.00%	0.40	0.06
9	5.00%	0.45	0.22
10	3.46%	0.35	0.33
11	2.39%	0.26	0.40
12	1.66%	0.20	0.43
13	1.15%	0.15	0.43
14	0.79%	0.11	0.40
15	0.55%	0.08	0.36

TOTAL PERCENT= 100.00%
AVERAGE TIME= 6.90 DAYS
VARIANCE= 3.20 DAYS^2
STANDARD DEVIATION= 1.79 DAYS

FIVE(5) BMC/ASF ZONES OUT

ACTUAL DELIVERY TIME (DAYS)	PERCENT OF TOTAL VOLUME	WEIGHTED TIME (DAYS)	WEIGHTED SQUARED DEVIATION (DAYS^2)
2	0.00%	0.00	0.00
3	0.00%	0.00	0.00
4	0.00%	0.00	0.00
5	0.00%	0.00	0.00
6	0.00%	0.00	0.00
7	70.00%	4.90	0.55
8	10.00%	0.80	0.00
9	5.00%	0.45	0.06
10	5.00%	0.50	0.22
11	3.54%	0.39	0.34
12	2.51%	0.30	0.43
13	1.78%	0.23	0.47
14	1.26%	0.18	0.47
15	0.89%	0.13	0.45

TOTAL PERCENT= 100.00%
AVERAGE TIME= 7.88 DAYS
VARIANCE= 3.00 DAYS^2
STANDARD DEVIATION= 1.73 DAYS

APPENDIX 2-22
(CONTINUED)

SIX(6) OR SEVEN(7) BMC/ASF ZONES OUT

ACTUAL DELIVERY TIME (DAYS)	PERCENT OF TOTAL VOLUME	WEIGHTED TIME (DAYS)	WEIGHTED SQUARED DEVIATION (DAYS^2)
2	0.00%	0.00	0.00
3	0.00%	0.00	0.00
4	0.00%	0.00	0.00
5	0.00%	0.00	0.00
6	0.00%	0.00	0.00
7	0.00%	0.00	0.00
8	70.00%	5.60	0.52
9	10.00%	0.90	0.00
10	5.00%	0.50	0.06
11	5.00%	0.55	0.23
12	3.71%	0.44	0.36
13	2.75%	0.36	0.47
14	2.04%	0.29	0.54
15	1.51%	0.23	0.57
TOTAL PERCENT=	100.00%		
AVERAGE TIME=		8.86 DAYS	
VARIANCE=			2.76 DAYS^2
STANDARD DEVIATION=			1.66 DAYS

APPENDIX 2-23

ESTIMATE OF POSTAL TRANSIT TIMES

Destination City	Service Region	Zones from Home Center	Zones from Other Center	Days from Home Center	Days from Other Center
Cincinnati	East	0	4	2.9	6.9
Salt Lake City	West	0	4	2.9	6.9
Indianapolis	East	0	4	2.9	6.9
Charleston	East	0	4	2.9	6.9
Frankfort	East	0	4	2.9	6.9
Boise	West	0	4	2.9	6.9
Columbia	East	1	5	3.9	7.9
Seattle	West	1	5	3.9	7.9
Lansing	East	1	4	3.9	6.9
Santa Fe	West	1	4	3.9	6.9
Little Rock	East	1	3	3.9	5.9
Salem	West	1	5	3.9	7.9
Atlanta	East	1	4	3.9	6.9
Los Angeles	West	1	5	3.9	7.9
Cleveland	East	1	5	3.9	7.9
Carson City	West	1	5	3.9	7.9
Helena	West	1	4	3.9	6.9
Cheyenne	West	1	3	3.9	5.9
Montgomery	East	1	4	3.9	6.9
Denver	West	1	3	3.9	5.9
Jackson	East	1	3	3.9	5.9
Baton Rouge	East	1	3	3.9	5.9
Phoenix	West	1	5	3.9	7.9
Sacramento	West	1	5	3.9	7.9
Nashville	East	1	3	3.9	5.9
Raleigh	East	1	5	3.9	7.9
Milwaukee	East	2	3	4.9	5.9
Dover	East	2	6	4.9	8.9
Jefferson City	East	2	2	4.9	4.9
Philadelphia	East	2	6	4.9	8.9
Albany	East	2	6	4.9	8.9
Des Moines	West	2	2	4.9	4.9
Chicago	East	2	3	4.9	5.9
Austin	West	2	2	4.9	4.9
Richmond	East	2	6	4.9	8.9
Emporia	West	2	2	4.9	4.9
Baltimore	East	2	6	4.9	8.9
Pierre	West	2	3	4.9	5.9
Lincoln	West	2	2	4.9	4.9
Daytona Beach	East	2	5	4.9	7.9
Washington, DC	East	2	6	4.9	8.9
Grand Forks	West	3	4	5.9	6.9
Trenton	East	3	7	5.9	8.9
New York	East	3	7	5.9	8.9
Oklahoma City	West	3	2	5.9	4.9
Faribault	West	3	3	5.9	5.9
Augusta	East	3	7	5.9	8.9
Providence	East	3	7	5.9	8.9
Watertown	East	3	7	5.9	8.9
Rocky Hill	East	3	7	5.9	8.9
Concord	East	3	7	5.9	8.9
Montpelier	East	3	7	5.9	8.9

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APPENDIX 2-24

PROPOSED MAILING TEST

1. According to the USPS, braille books and playback machines circulated by the network as free matter for the blind are treated as parcel post items in both processing and transportation. The previous study had used bulk business mail delivery standards for estimation of delivery times.

2. According to the USPS, the best method for estimating the delivery time of parcels within the continental U.S. is to count the number of bulk mail zones that a parcel must pass through from the point of origin to the point of destination. The previous study had used over-the-road miles in tandem with bulk business mail standards for distance ranges for estimation of delivery times.

3. According to the USPS, 70% of parcels are delivered to their destinations in the "target time", 10% are delivered one day longer than the target time, 5% are delivered two days longer that the target time, 5% are delivered three days longer than the target time, and smaller, rapidly declining percentages apply to delivery times for more than three days over target, with 15 days delivery time being the absolute maximum (e.g. a parcel "mis-keyed" on the east coast that goes to the west coast and back to its proper destination on the east coast).

4. The target time for parcel post delivery in the continental U.S. is two(2) days within the originating BMC/ASF zone, and one additional day for each zone that a parcel must pass through on the most direct route to its final destination, to a maximum of eight(8) days.

5. The USPS bulk mail network, which consists of BMCs,ASFs and zones is shown in Appendix 2-21 of the Study I,Part 1 report.

6. Based upon (3.) and (4.) above, ManTech calculated theoretical profiles of parcel delivery times based upon "same zone","one zone from origin",etc., which are attached as Attachment 1. These profiles show the probability distributions of delivery times for each case, the average delivery time, and the variance and standard deviation of delivery time for each case.

7. The objective of a mailing test is to estimate the average (mean) delivery time for all parcels based upon the mean delivery time for a sample of parcels sent from a specific origin to a specific destination. In this case, the origin points are Salt Lake City and Cincinnati, and the destinations are one or several points in each bulk mail zone. For each origin-destination combination chosen, the sample size is a function of the desired degree of precision, the desired probability that the specified degree of precision will be obtained, and the variability of the sampled data.

8. ManTech recommends that the degree of precision specified be 1.0 days. Given that a patron receives mail from the USPS typically

once per day, any greater degree of precision is not warranted.

9. ManTech recommends that the confidence level selected be 90%. A greater level of confidence can be achieved by increasing sample size, but we do not believe the extra, incremental effort is warranted.

10. The actual variability of delivery times is currently unknown; sampling of this type is often an iterative process whereby the variability of the first test is used as an input to a second test,etc. ManTech recommends that the test be formulated using the variability of delivery times based upon USPS standards ... there really is no other alternative.

11. Attachment 2 contains the required sample sizes (number of parcels) that should be mailed to each destination point based upon all three factors. Note that, surprisingly, the sample size for "longer-haul" deliveries (7.5) is smaller than that for "same zone" deliveries (10.1) because the variability is lower for longer distances. This sample size estimation assumes that observations are normally distributed and that the population is large relative to the sample.

12. ManTech recommends that, for both the sake of economy and practicality, only delivery times within regions be tested. That is, test parcels should be mailed from Salt Lake City to various points in the Western service region and parcels should be mailed from Cincinnati to various points in the Eastern service region. Although it has been recommended that the Western center service all patrons with materials from several special collections, it is not recommended that tests be run e.g. Salt Lake to Miami. If NLS determines that such tests are necessary, Attachment 2 of this letter and Appendix 2-21 will provide the guidance for this.

13. It is recommended that each bulk mail zone within each center's service region be tested. This is recommended both to provide a complete coverage of the region, and because of the relatively large degree of autonomy, and possibly performance differences, among the various BMCs/ASFs in the USPS network.

14. It is recommended that two (2) locations within each bulk mail zone be designated as destination points. One of these points should be in the metropolitan area that contains the BMC/ASF for the destination zone, and the other point should be located at some distance from that BMC/ASF metropolitan area in another city or town, not even necessarily in the same state.

15. It is recommended that parcels mailed to all test destinations from a given MSC for a given mailing be mailed on the same day, because this eliminates one element of variability.

16. It is recommended that a complete test be administered using one day-of-the-week as the mailing day for all mailings. It is tentatively recommended that this day be Monday, and if time and

resources later permit, a second full test should be run with mailings on Friday. Two such tests would take into account the differences due to mail being processed and transported every day of the week, but being delivered only on weekdays.

17. Attachment 3 shows the profile of the recommended test plan, with point of origin, points of destination, and number of parcels required to fulfill the objectives of the test. It is incumbent upon NLS to determine the "secondary sites" within each bulk mail zone and to identify the patrons and/or libraries within each zone who are to receive the test parcels and telephone the receipt dates back to the MSCs and/or NLS.

ATTACHMENT 2

REQUIRED SAMPLE SIZES FOR POINT-TO-POINT MAIL TESTS

CONFIDENCE LEVEL = 90% (z=1.65)
DEGREE OF PRECISION= 1.0 DAYS (e=1.0)
STANDARD DEVIATION= BASED UPON USPS PERFORMANCE STANDARDS (o=VARIES)
SAMPLE SIZE = z o /e

DISTANCE TRAVERSED	TARGET DELIVERY TIME(DAYS)	AVERAGE DELIVERY TIME(DAYS)	STANDARD DEVIATION (DAYS)	REQUIRED SAMPLE SIZE (PARCELS)
SAME ZONE	2	2.93	1.93	10.1
1 ZONE OUT	3	3.93	1.91	9.9
2 ZONES OUT	4	4.92	1.88	9.6
3 ZONES OUT	5	5.91	1.84	9.2
4 ZONES OUT	6	6.9	1.79	8.7
5 ZONES OUT	7	7.88	1.73	8.1
6 OR 7 ZONES OUT	8	8.86	1.66	7.5

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ATTACHMENT 3

PROFILE OF MAILING TEST

CENTRAL SERVICE REGION	ORIGIN MSC	BMC/ASF CITY	BMC/ASF STATE	FACILITY TYPE (1)	ZONES FROM ORIGIN	PARCELS TO FIRST DESTINATION (IN METRO AREA)	PARCELS TO SECOND DESTINATION	TOTAL PARCELS
EAST	CINCINNATI	WASHINGTON	D.C.	BMC	2	10	10	20
EAST	CINCINNATI	JACKSONVILLE	FLORIDA	BMC	2	10	10	20
EAST	CINCINNATI	ATLANTA	GEORGIA	BMC	1	10	10	20
EAST	CINCINNATI	CHICAGO	ILLINOIS	BMC	2	10	10	20
EAST	CINCINNATI	SPRINGFIELD	MASSACHUSETTS	BMC	3	9	9	18
EAST	CINCINNATI	DETROIT	MICHIGAN	BMC	1	10	10	20
EAST	CINCINNATI	ST.LOUIS	MISSOURI	BMC	1	10	10	20
EAST	CINCINNATI	JERSEY CITY	NEW JERSEY	BMC	3	9	9	18
EAST	CINCINNATI	BUFFALO	NEW YORK	ASF	2	10	10	20
EAST	CINCINNATI	GREENSBORO	NORTH CAROLINA	BMC	1	10	10	20
EAST	CINCINNATI	CINCINNATI	OHIO	BMC	0	10	10	20
EAST	CINCINNATI	PITTSBURGH	PENNSYLVANIA	BMC	1	10	10	20
EAST	CINCINNATI	PHILADELPHIA	PENNSYLVANIA	BMC	2	10	10	20
EAST	CINCINNATI	MEMPHIS	TENNESSEE	BMC	1	10	10	20
			EASTERN SUB-TOTAL			138	138	276
WEST	SALT LAKE	PHOENIX	ARIZONA	ASF	1	10	10	20
WEST	SALT LAKE	SAN FRANCISCO	CALIFORNIA	BMC	1	10	10	20
WEST	SALT LAKE	LOS ANGELES	CALIFORNIA	BMC	1	10	10	20
WEST	SALT LAKE	DENVER	COLORADO	BMC	1	10	10	20
WEST	SALT LAKE	DES MOINES	IOWA	BMC	2	10	10	20
WEST	SALT LAKE	KANSAS CITY	KANSAS	BMC	2	10	10	20
WEST	SALT LAKE	MINNEAPOLIS	MINNESOTA	BMC	3	9	9	18
WEST	SALT LAKE	BILLINGS	MONTANA	ASF	1	10	10	20
WEST	SALT LAKE	ALBUQUERQUE	NEW MEXICO	ASF	1	10	10	20
WEST	SALT LAKE	FARGO	NORTH DAKOTA	ASF	3	9	9	18
WEST	SALT LAKE	OKLAHOMA CITY	OKLAHOMA	ASF	3	9	9	18
WEST	SALT LAKE	SIOUX FALLS	SOUTH DAKOTA	ASF	2	10	10	20
WEST	SALT LAKE	DALLAS	TEXAS	BMC	2	10	10	20
WEST	SALT LAKE	SALT LAKE CITY	UTAH	ASF	0	10	10	20
WEST	SALT LAKE	SEATTLE	WASHINGTON	BMC	1	10	10	20
			WESTERN SUB-TOTAL			147	147	294
					TOTAL	285	285	570

BMC - BULK MAIL CENTER
ASF - AUXILIARY SERVICE FACILITY

APPENDIX 2-24 (CONTINUED)

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APPENDIX 2-25
HAWAII MAILING ANALYSIS
ALTERNATIVES TO FREE MATTER DELIVERY

I. Assumptions:
- Origin Zip Code = 84115
- Destination Zip Code = 96815
- New Braille Container Weight = 13 oz = 0.8 lbs
- Large Braille Volume Weight = 3 lbs 5 oz = 3.3 lbs
- Average Mailed Parcel Weight = 4 lbs
- Reported FY91 HIRL Braille Circulation = 1,110 volumes
- Pro Forma HIRL Braille Circulation = 1,940 volumes

II. Service via USPS:
- First Class, Parcel
- Priority Mail Rate Schedule Applicable
- Hawaii is "Zone 8" from Salt Lake City, Vice Versa
- Fall 1992 Rate for 4 lbs, Zone 8 = $4.65
- Delivery Time = 3-4 days

III. Service via UPS
- "Two-Day Air" Service Applicable
- No "Ground Service (Ship)" to Hawaii via UPS
- Fall 1992 Rate for 4 lbs = $12.75
- Delivery Time = 2 days

IV. Comparison of Alternative Delivery Schemes

	USPS	UPS
Annual Delivery/Return Cost, Current Circulation	$10,323	$28,305
Annual Delivery/Return, Pro Forma Circulation	$18,042	$49,470
Delivery Time	3-4 Days	2 Days

V. Current Facility/Occupancy Costs for Braille Storage in Hawaii RL (Braille Stored in Compact Shelving)

- Measured, utilized Braille Storage Area in 1990 = 1,046 sf
- Estimated Braille Storage Area, FY91
  (18,700 volumes) x (1 sf/18 volumes) = 1,039 sf
- Storage Area Used in Calculation = 1,040 sf
- 1990 Occupancy Cost, HIRL = $17.11/sf/year
- Estimated Annual Current Braille Storage Costs = $17,794

APPENDIX 3-1

DATABASE SIZING
PRIMARY SYSTEM

PATRON MAIN			OPTION "A"	OPTION "B"	OPTION "C"
IDENT	REC LGTH	(PATRONs)	20,246	20,246	20,246
PATRON_ID	13		263,198	263,198	263,198
PATRON_LANG	1		20,246		
PATRON_NAME_FIRST	10		202,460	202,460	202,460
PATRON_NAME_MI	1		20,246	20,246	20,246
PATRON_NAME_LAST	29		587,134	587,134	587,134
PATRON_CONTACT	40		809,840		
PATRON_ACTIVITY_FIRST (DATE)	8		161,968		
PATRON_ACTIVITY_LAST (DATE)	8		161,968		
PATRON_ADDRESS_1	26		526,396	526,396	526,396
PATRON_CITY_1	19		384,674	384,674	384,674
PATRON_STATE_1	2		40,492	40,492	40,492
PATRON_ZIP_1	5		101,230	101,230	101,230
PATRON_ZIP_PLUS_1	4		80,984	80,984	80,984
PATRON_ADDRESS_2	26		526,396	526,396	526,396
PATRON_CITY_2	19		384,674	384,674	384,674
PATRON_STATE_2	2		40,492	40,492	40,492
PATRON_ZIP_2	5		101,230	101,230	101,230
PATRON_ZIP_PLUS_2	4		80,984	80,984	80,984
PATRON_ALT_POC	40		809,840		
PATRON_AREA_CODE_2	3		60,738		
PATRON_EXCHANGE_2	3		60,738		
PATRON_PHONE_NUMBER_2	4		80,984		
PATRON_DOB (DATE)	8		161,968		
PATRON_SEX	1		20,246		
PATRON_DISABILITY	2		40,492		
PATRON_AREA_CODE_1	3		60,738		
PATRON_EXCHANGE_1	3		60,738		
PATRON_PHONE_NUMBER_1	4		80,984		
PATRON_AUTO_SELECT (Y/N)	1		20,246		
PATRON_SUBJECT_CODES 1 thru 32	96		1,943,616		
PATRON_PROFANITY	1		20,246		
PATRON_SEX	1		20,246		
PATRON_VIOLENCE	1		20,246		
PATRON_QUOTA	3		60,738		
PATRON_TYPE (INDV/INST)	1		20,246		
PATRON_FREQUENCY	1		20,246	20,246	20,246
PATRON_REG_LIBRARY_ID	4		80,984	80,984	80,984
SUB-TOTAL	402		8,138,892	3,441,820	3,441,820

PATRON CHECKOUT (NOW HAS) MAX 25 BOOKS			OPTION "A"	OPTION "B"	OPTION "C"
IDENT	REC LGTH	(VOLs)	506,150	506,150	506,150
PATRON_ID	13		6,579,950	6,579,950	6,579,950
PATCHK_TITLE_ID	7		3,543,050	3,543,050	3,543,050
PATCHK_VOL_NUMBER	2		1,012,300	1,012,300	1,012,300
PATCHK_SENT_DATE	8		4,049,200	4,049,200	4,049,200
SUB-TOTAL	30		15,184,500	15,184,500	15,184,500

PATRON HAS HAD					
IDENT	REC LGTH	BASED ON 10 A YR X 20,246			
PATRON_ID	13		28,951,780		
PATRON_TITLE_ID	8		17,816,480		
SUB-TOTAL	21		46,768,260	0	0

PATRON RESERVE LIST (MAX 50 BOOKS)					
IDENT	REC LGTH	(PATRONs)	20,246	20,246	20,246
PATRON_ID	13		13,159,900		
PATRON_TITLE_ID	8		8,098,400		
PATRON_DATE_SELECTED	8		8,098,400		
SUB-TOTAL	29		29,356,700	0	0

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APPENDIX 3-1 (Continued)

BOOK RECORD (TITLE) BR/BRA/BRF/BRJ/BRX/PRE 13,000			OPTION "A"	OPTION "B"	OPTION "C"
IDENT	REC LGTH	(TITLEs)	28,983	28,983	28,983
TITLE_ID	8		231,864	231,864	231,864
TITLE_NAME	70		2,028,810	2,028,810	2,028,810
TITLE_SUBJECT_CODE 1	3		86,949	86,949	86,949
TITLE_SUBJECT_CODE 2	3		86,949	86,949	86,949
TITLE_SUBJECT_CODE 3	3		86,949	86,949	86,949
TITLE_SUBJECT_CODE 4	3		86,949	86,949	86,949
TITLE_PROFANITY	1		28,983	28,983	28,983
TITLE_SEX	1		28,983	28,983	28,983
TITLE_VIOLENCE	1		28,983	28,983	28,983
TITLE_AUTHOR	6		173,898	173,898	173,898
TITLE_ORIG_DATE	4		115,932	115,932	115,932
TITLE_ABSTRACT	400		11,593,200	11,593,200	11,593,200
TITLE_ABSTRACT_ID	6		173,898	173,898	173,898
TITLE_LANGUAGE	2		57,966	57,966	57,966
TITLE_ADULT/YOUTH	1		28,983	28,983	28,983
TITLE_GRD_LVL	1		28,983	28,983	28,983
SUB-TOTAL	513		14,868,279	14,868,279	14,868,279
BOOK BARCODE (TITLE) BR/BRA/BRF/BRJ/BRX/PRE 13,000					
IDENT	REC LGTH	(VOLs)	1,230,996	1,230,996	1,230,996
TITLE_ID	8		9,847,968	9,847,968	9,847,968
TITLE_VOL_NUMBER	2		2,461,992	2,461,992	2,461,992
TITLE_BAR_CODE	12		14,771,952	14,771,952	14,771,952
TITLE_SHIP_DATE	8		9,847,968	9,847,968	9,847,968
SUB-TOTAL	30		36,929,880	36,929,880	36,929,880
MASTER BOOK (TITLE) BRM (BRA MASTERS)					
IDENT	REC LGTH	(TITLEs)	4,307	4,307	4,307
MASTER_ID	8		34,456	34,456	34,456
MASTER_NAME	70		301,490	301,490	301,490
MASTER_AUTHOR	6		25,842	25,842	25,842
MASTER_ORIG_DATE	4		17,228	17,228	17,228
MASTER_ABSTRACT	400		1,722,800	1,722,800	1,722,800
MASTER_ABSTRACT_ID	6		25,842	25,842	25,842
MASTER_LANGUAGE	2		8,614	8,614	8,614
SUB-TOTAL	496		2,136,272	2,136,272	2,136,272
MASTER BARCODE (TITLE) BRM (BRA MASTERS)					
IDENT	REC LGTH	(VOLs)	30,063	30,063	30,063
MASTER_ID	8		240,504	240,504	240,504
MASTER_BAR_CODE	12		360,756	360,756	360,756
MASTER_SHIP_DATE	8		240,504	240,504	240,504
SUB-TOTAL	28		841,764	841,764	841,764
MAGAZINE MASTER (TITLE)					
IDENT	REC LGTH	(MAGS)	7,496	7,496	7,496
MAG_ID	4		29,984	29,984	29,984
MAG_NAME	70		524,720	524,720	524,720
MAG_VOL_ID	4		29,984	29,984	29,984
MAG_ISSUE_DATE	6		44,976	44,976	44,976
MAG_ABSTRACT	70		524,720	524,720	524,720
MAG_ABSTRACT_ID	6		44,976	44,976	44,976
SUB-TOTAL	160		1,199,360	1,199,360	1,199,360

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MAGAZINE BARCODE (TITLE)			OPTION "A"	OPTION "B"	OPTION "C"
IDENT	REC LGTH	(MAGS)	3,748	3,748	3,748
MAG_ID	4		14,992	14,992	14,992
MAG_VOL_ID	4		14,992	14,992	14,992
MAG_BAR_CODE	12		44,976	44,976	44,976
MAG_SHIP_DATE	8		29,984	29,984	29,984
SUB-TOTAL	28		104,944	104,944	104,944
TOTAL PRIMARY CAPACITY					
	TOTAL	(BYTES)	155,528,851	74,706,819	74,706,819
	MEGABYTES		148	71	71
	1,048,576 Bytes = 1 Megabyte				

SUB-SYSTEMS

WEST SUB BOOK (TITLE) BR/BRA/BRF/BRJ/BRX/PRE 13,000			OPTION "A"	OPTION "B"	OPTION "C"
IDENT	REC LGTH	(VOLs)	472,385	472,385	472,385
TITLE_BAR_CODE	12		5,668,620	5,668,620	5,668,620
TITLE_BAR_CODE_LOCATOR	12		5,668,620	5,668,620	5,668,620
SUB-TOTAL	24		11,337,240	11,337,240	11,337,240
WEST SUB MASTER (TITLE) BRM (BRA MASTERS)					
IDENT	REC LGTH	(VOLs)	30,063	30,063	30,063
MASTER_BAR_CODE	12		360,756	360,756	360,756
MASTER_BAR_CODE_LOCATOR	12		360,756	360,756	360,756
SUB-TOTAL	24		721,512	721,512	721,512
WEST SUB MAGAZINE (TITLE)					
IDENT	REC LGTH	(MAGS)	3,748	3,748	3,748
MAG_BAR_CODE	12		44,976	44,976	44,976
MAG_BAR_CODE_LOCATOR	12		44,976	44,976	44,976
SUB-TOTAL	24		89,952	89,952	89,952
TOTAL CAPACITY WEST					
	TOTAL	(BYTES)	12,148,704	12,148,704	12,148,704
	MEGABYTES		12	12	12
	1,048,576 Bytes = 1 Megabyte				

EAST SUB BOOK (TITLE) BR/BRA/BRF/BRJ/BRX/PRE 13,000			OPTION "A"	OPTION "B"	OPTION "C"
IDENT	REC LGTH	(VOLs)	758,611	758,611	758,611
TITLE_BAR_CODE	12		9,103,332	9,103,332	9,103,332
TITLE_BAR_CODE_LOCATOR	12		9,103,332	9,103,332	9,103,332
SUB-TOTAL	24		18,206,664	18,206,664	18,206,664
EAST SUB MAGAZINE (TITLE)					
IDENT	REC LGTH	(MAGS)	3,748	3,748	3,748
MAG_BAR_CODE	12		44,976	44,976	44,976
MAG_BAR_CODE_LOCATOR	12		44,976	44,976	44,976
SUB-TOTAL	24		89,952	89,952	89,952
TOTAL CAPACITY EAST					
	TOTAL	(BYTES)	18,296,616	18,296,616	18,296,616
	MEGABYTES		17	17	17
	1,048,576 Bytes = 1 Megabyte				

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APPENDIX 3-1 (Continued)

AGGREGATE TOTAL

GRAND TOTAL		OPTION "A"	OPTION "B"	OPTION "C"
	TOTAL (BYTES)	185,974,171	105,152,139	105,152,139
	MEGABYTES	177	100	100
	1,048,576 Bytes = 1 Megabyte			

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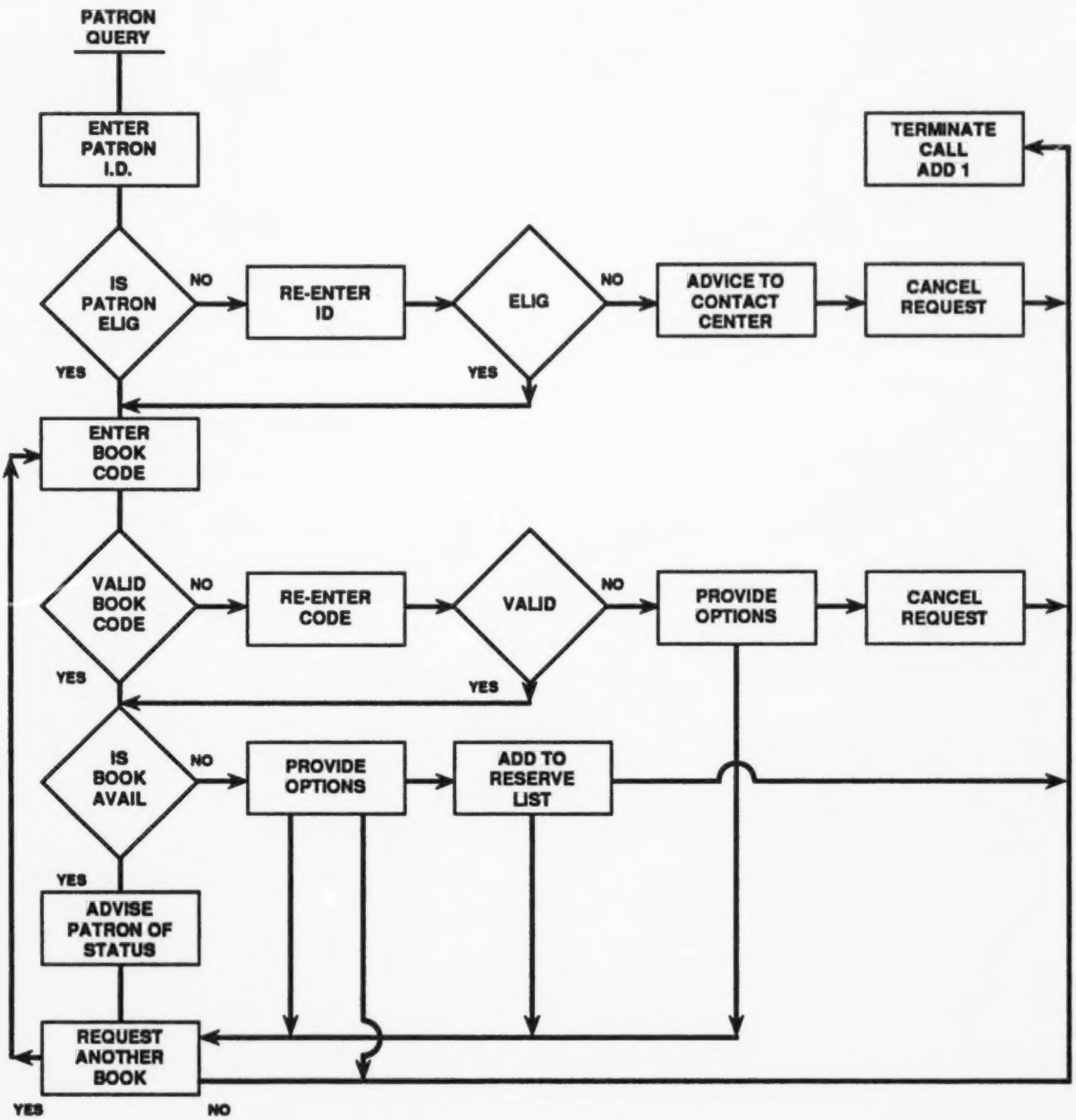
APPENDIX 3-2

DIRECT PATRON ACCESS



* Each response by the User should be reiterated, verbally, by the system and the system should also provide the User the opportunity to change the response

APPENDIX 3-3

COMPUTER/PERIPHERAL HARDWARE COSTS (One-time)							
DESCRIPTION	UNIT COST	OPTIONS "A"		OPTIONS "B"		OPTIONS "C"	
		UNITS	COST	UNITS	COST	UNITS	COST
PRIMARY							
Dumb Terminals	359	8	2,872	2	718	2	718
Tape Backup Drive	1,735	1	1,735	1	1,735	1	1,735
System Printer	4,725	1	4,725	1	4,725	1	4,725
Dual Processor	36,595	1	36,595	1	36,595	1	36,595
Gateway (Modem 9600)	779	1	779	1	779	1	779
Backup Power Supply	1099	1	1,099	1	1,099	1	1,099
Installation			3,500		3,500		3,500
SUB TOTAL			**51,305**		**49,151**		**49,151**
SUB-SYSTEM							
Sub-System Servers	2,995	4	11,980	4	11,980	4	11,980
Modem (9600)	529	1	529	1	529	1	529
Office Printers	399	2	798	2	798	2	798
Pick Ticket/Barcode Printer	1,995	2	3,990	2	3,990	2	3,990
Backup Power Supply	1099	1	1,099	1	1,099	1	1,099
Barcode Hardware			28,250		28,250		28,250
Installation			3,000		3,000		3,000
SUB TOTAL			**49,646**		**49,646**		**49,646**
TOTAL			**100,951**		**98,797**		**98,797**

COMPUTER/PERIPHERAL HARDWARE COSTS (Recurring)							
DESCRIPTION	UNIT COST	OPTIONS "A"		OPTIONS "B"		OPTIONS "C"	
		UNITS	COST	UNITS	COST	UNITS	COST
PRIMARY							
Maintenance			2,200		2,200		2,200
SUB-SYSTEM							
Maintenance			1,400		1,400		1,400
TOTAL			**3,600**		**3,600**		**3,600**

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APPENDIX 3-4

SOFTWARE COSTS (One-time)			
DESCRIPTION	OPTIONS "A" COST	OPTIONS "B" COST	OPTIONS "C" COST
PRIMARY			
System Software	1,600	1,600	1,600
Custom Software	165,000	165,000	165,000
Direct Access Software	15,300	15,300	
Barcode Software	2,400	2,400	2,400
Installation	11,450	11,450	11,000
Training	5,000	3,000	3,000
SUB TOTAL	200,750	198,750	183,000
SUB-SYSTEM			
Software	1,300	1,300	1,300
Barcode Software	2,400	2,400	2,400
Installation	2,000	2,000	2,000
Training	1,000	1,000	1,000
SUB TOTAL	6,700	6,700	6,700
TOTAL	207,450	205,450	189,700

SOFTWARE COSTS (Recurring)			
DESCRIPTION	OPTIONS "A" COST	OPTIONS "B" COST	OPTIONS "C" COST
PRIMARY			
Maintenance	8,000	8,000	8,000
SUB-SYSTEM			
Maintenance	850	850	850
TOTAL	8,850	8,850	8,850

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APPENDIX 3-5

TELECOMMUNICATION COSTS (One-time)			
DESCRIPTION	OPTIONS "A" COST	OPTIONS "B" COST	OPTIONS "C" COST
Communication Hardware	4,737	600	600
Auto Attendant	17,000	17,000	
Network Software	8,500	8,500	8,500
FAX Machine (2)	3,000	3,000	3,000
Installation	2,901	1,300	1,200
TOTAL	36,138	30,400	13,300

TELECOMMUNICATION COSTS (Recurring)			
DESCRIPTION	OPTIONS "A" COST	OPTIONS "B" COST	OPTIONS "C" COST
(800) Communication Lines	53,028	18,556	1,898
7 Digit Lines	10,464	10,464	10,464
Communications Net Link	18,300	18,300	18,300
TOTAL	81,792	47,320	30,662

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PRO FORMA TELEPHONE VOICE CALL TRAFFIC CENTRALIZED BRAILLE DISTRIBUTION (OPTION A)			EST'D TOTAL	AVERAGE NUMBER OF	AVERAGE NUMBER OF	AVERAGE NUMBER OF MONTHLY		RANGE	RANGE	RANGE CODE TO	MONTHLY COST	MONTHLY COST	MONTHLY COST TO
STATE	CITY(1)	REGION	READERS	DAILY CALLS	MONTHLY CALLS	CONNECT MINUTES	AREA CODE	CODE TO WEST	CODE TO EAST	REGIONAL CENTER	TO WEST	TO EAST	REGIONAL CENTER
ALASKA	ANCHORAGE	WEST	27	0.4	9	27	907	5	6	5	6.90	7.54	6.90
ARIZONA	PHOENIX	WEST	70	1.1	23	70	602	2	4	2	16.79	17.61	16.79
CALIFORNIA	LOS ANGELES	WEST	785	12.6	262	787	213	3	5	3	191.47	200.65	191.47
CALIFORNIA	SACRAMENTO	WEST	797	12.8	266	799	916	3	5	3	194.40	203.72	194.40
COLORADO	DENVER	WEST	150	2.4	50	150	303	2	4	2	35.99	37.74	35.99
HAWAII	HONOLULU	WEST	87	1.4	29	87	808	5	6	5	22.24	24.30	22.24
IDAHO	BOISE	WEST	51	0.8	17	51	208	2	4	2	12.24	12.83	12.24
IOWA	DES MOINES	WEST	453	7.3	151	454	515	4	3	4	113.98	110.49	113.98
KANSAS	EMPORIA	WEST	84	1.3	28	84	316	3	3	3	20.49	20.49	20.49
MINNESOTA	FARIBAULT	WEST	492	7.9	164	493	507	4	3	4	123.79	120.01	123.79
MONTANA	HELENA	WEST	23	0.4	8	23	406	3	4	3	5.61	5.79	5.61
NEBRASKA	LINCOLN	WEST	109	1.7	36	109	402	3	3	3	26.59	26.59	26.59
NEVADA	CARSON CITY	WEST	20	0.3	7	20	702	2	4	2	4.80	5.03	4.80
NEW MEXICO	SANTA FE	WEST	90	1.4	30	90	505	3	4	3	21.95	22.64	21.95
NORTH DAKOTA	GRAND FORKS	WEST	20	0.3	7	20	701	3	4	3	4.88	5.03	4.88
OKLAHOMA	OKLAHOMA CITY	WEST	162	2.6	54	162	405	3	3	3	39.51	39.51	39.51
OREGON	SALEM	WEST	175	2.8	58	175	503	3	5	3	42.69	44.73	42.69
SOUTH DAKOTA	PIERRE	WEST	39	0.6	13	39	605	3	3	3	9.51	9.51	9.51
TEXAS	AUSTIN	WEST	2,181	35.0	729	2,186	512	4	4	4	548.74	548.74	548.74
UTAH	SALT LAKE CITY	WEST	218	3.5	73	219	801	1	4	1	50.55	54.85	50.55
WASHINGTON	SEATTLE	WEST	476	7.6	159	477	206	3	5	3	116.10	121.67	116.10
WYOMING	CHEYENNE	WEST	33	0.5	11	33	307	2	4	2	7.92	8.30	7.92
ALABAMA	MONTGOMERY	EAST	255	4.1	85	256	205	4	3	3	64.16	62.20	62.20
ARKANSAS	LITTLE ROCK	EAST	134	2.1	45	134	501	4	3	3	33.71	32.68	32.68
CONNECTICUT	ROCKY HILL	EAST	327	5.2	109	328	203	5	3	3	83.58	79.76	79.76
DELAWARE	DOVER	EAST	78	1.3	26	78	302	5	3	3	19.94	19.03	19.03
DIST.OF COL.	WASHINGTON	EAST	64	1.0	21	64	202	4	2	2	16.10	15.35	15.35
FLORIDA	DAYTONA BEACH	EAST	828	13.3	277	830	904	4	3	3	208.33	201.96	201.96
GEORGIA	ATLANTA	EAST	350	5.6	117	351	404	4	2	2	88.06	83.97	83.97
ILLINOIS	CHICAGO	EAST	780	12.5	261	782	312	4	1	1	196.25	180.87	180.87
INDIANA	INDIANAPOLIS	EAST	359	5.8	120	360	317	4	1	1	90.32	83.25	83.25
KENTUCKY	FRANKFORT	EAST	153	2.5	51	153	502	4	1	1	38.49	35.48	35.48
LOUISIANA	BATON ROUGE	EAST	375	6.0	125	376	504	4	3	3	94.35	91.47	91.47
MAINE	AUGUSTA	EAST	63	1.0	21	63	207	5	3	3	16.10	15.37	15.37
MARYLAND	BALTIMORE	EAST	157	2.5	52	157	410	4	2	2	39.50	37.67	37.67

APPENDIX 3-6

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PRO FORMA TELEPHONE VOICE CALL TRAFFIC CENTRALIZED BRAILLE DISTRIBUTION (OPTION A)			EST'D TOTAL READERS	AVERAGE NUMBER OF DAILY CALLS	AVERAGE NUMBER OF MONTHLY CALLS	AVERAGE NUMBER OF MONTHLY CONNECT MINUTES	AREA CODE	RANGE CODE TO WEST	RANGE CODE TO EAST	RANGE CODE TO CLOSEST CENTER	MONTHLY COST TO WEST	MONTHLY COST TO EAST	MONTHLY COST TO CLOSEST CENTER
STATE	CITY(1)	REGION											
MASSACHUSETTS	WATERTOWN	EAST	770	12.3	257	772	617	5	3	3	196.82	187.82	187.82
MICHIGAN	LANSING	EAST	1,421	22.8	475	1,424	517	4	1	1	357.52	329.51	329.51
MISSISSIPPI	JACKSON	EAST	99	1.6	33	99	601	4	3	3	24.91	24.15	24.15
MISSOURI	JEFFERSON CITY	EAST	750	12.0	251	752	314	4	2	2	188.70	179.93	179.93
NEW HAMPSHIRE	CONCORD	EAST	39	0.6	13	39	603	5	3	3	9.97	9.51	9.51
NEW JERSEY	TRENTON	EAST	526	8.4	176	527	609	5	3	3	134.45	128.30	128.30
NEW YORK	NEW YORK	EAST	687	11.0	230	689	212	5	3	3	175.60	167.57	167.57
NEW YORK	ALBANY (3)	EAST	1,210	19.4	404	1,213	518	5	3	3	309.29	295.14	295.14
NORTH CAROLINA	RALEIGH	EAST	520	8.3	174	521	919	4	2	2	130.83	124.75	124.75
OHIO	CINCINNATI	EAST	667	10.7	223	669	513	4	1	1	167.82	154.67	154.67
OHIO	CLEVELAND	EAST	586	9.4	196	587	216	4	1	1	147.44	135.89	135.89
PENNSYLVANIA	PHILADELPHIA	EAST	1,242	19.9	415	1,245	215	4	3	3	312.49	302.94	302.94
PUERTO RICO	SAN JUAN	EAST	141	2.3	47	141	809	6	4	4	39.39	35.48	35.48
RHODE ISLAND	PROVIDENCE	EAST	40	0.6	13	40	401	5	3	3	10.22	9.76	9.76
SOUTH CAROLINA	COLUMBIA	EAST	82	1.3	27	82	803	4	2	2	20.63	19.67	19.67
TENNESSEE	NASHVILLE	EAST	211	3.4	71	212	615	4	1	1	53.09	48.93	48.93
VERMONT	MONTPELIER	EAST	57	0.9	19	57	802	5	3	3	14.57	13.90	13.90
VIRGIN ISLANDS	ST.CROIX	EAST	4	0.1	1	4	809	6	4	4	1.12	1.01	1.01
VIRGINIA	RICHMOND	EAST	284	4.6	95	285	804	4	2	2	71.45	68.13	68.13
WEST VIRGINIA	CHARLESTON	EAST	167	2.7	56	167	304	4	1	1	42.02	38.73	38.73
WISCONSIN	MILWAUKEE	EAST	282	4.5	94	283	414	4	2	2	70.95	67.65	67.65
OVERSEAS	MSCs (4)	BOTH	14	0.2	5	14	N/A	6	6	6	3.91	3.91	3.91
SUMMARIES BY REGION/NATION:		WEST	6,549	105	2,188	6,565				W/ DISCOUNT	4,326	4,194	4,168
		EAST	13,715	220	4,583	13,748							
		TOTAL	20,264	325	6,771	20,313							

RANGE CODE	RATE ($/HR)(2)
1	13.88
2	14.36
3	14.6
4	15.06
5	15.3
6	16.72

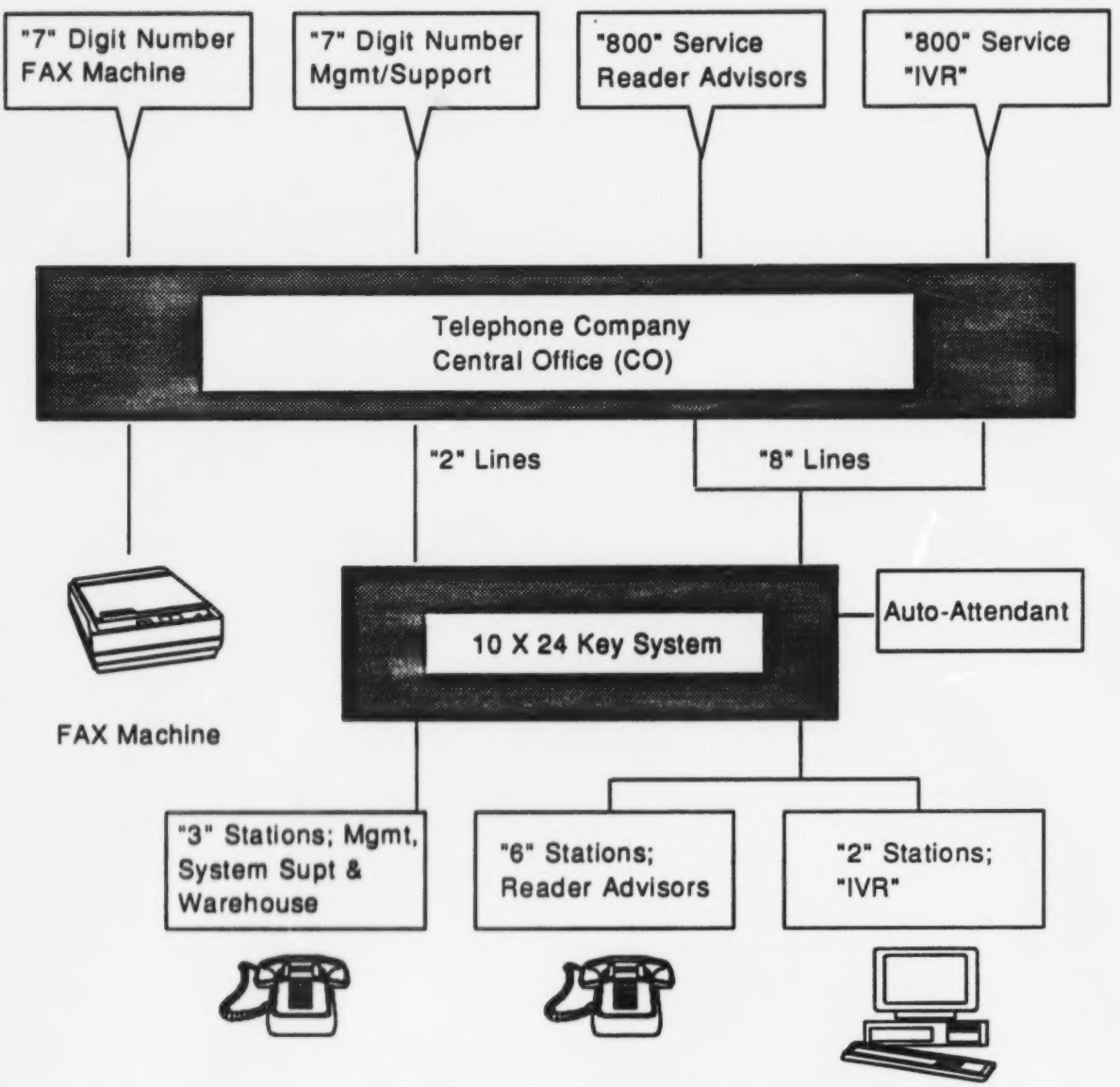
NOTE (1): CALLS MAY ORIGINATE FROM ALL OVER A STATE/PART OF STATE;
CITY SPECIFIED IS A "SIMPLIFYING ASSUMPTION."
(2): RATES BASED UPON AT&T 800 READYLINE SERVICE

ASSUMPTIONS:
325 CALLS PER DAY
250 WORKING DAYS PER YEAR (ALL MONDAY THRU FRIDAY)
HOURS OF TELEPHONE OPERATION: 9 AM TO 8 PM EASTERN TIME
3.0 MINUTES PER PHONE CALL AVERAGE, 3.25 MINUTES PER CALL STANDARD DEVIATION

APPENDIX 3-7

TELEPHONE CONFIGURATION

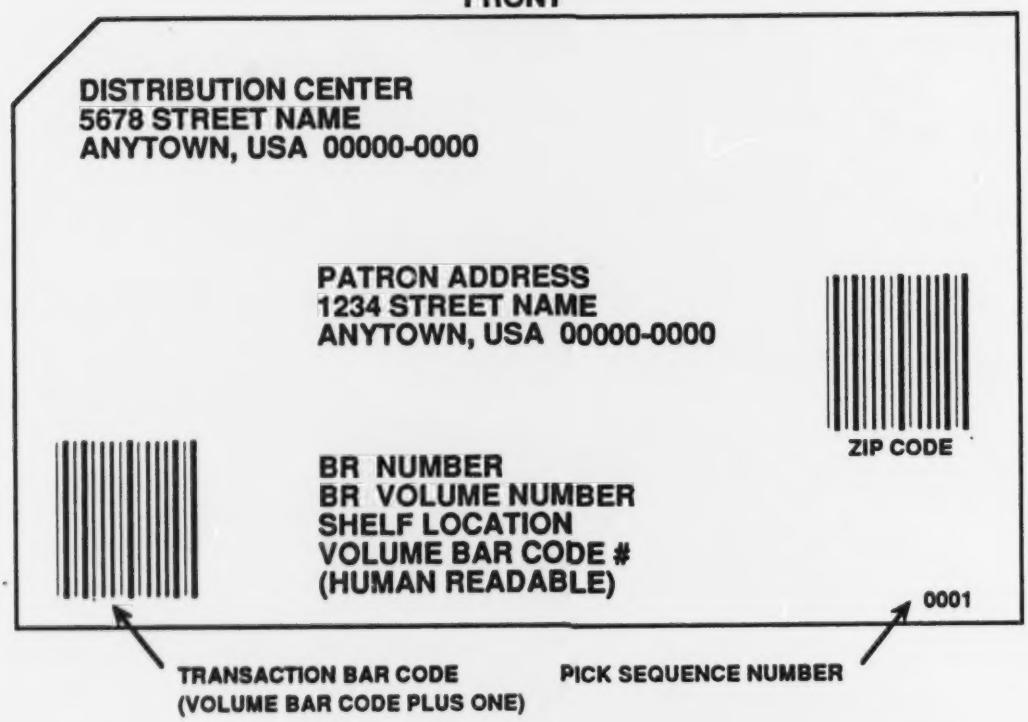
(Option "A")



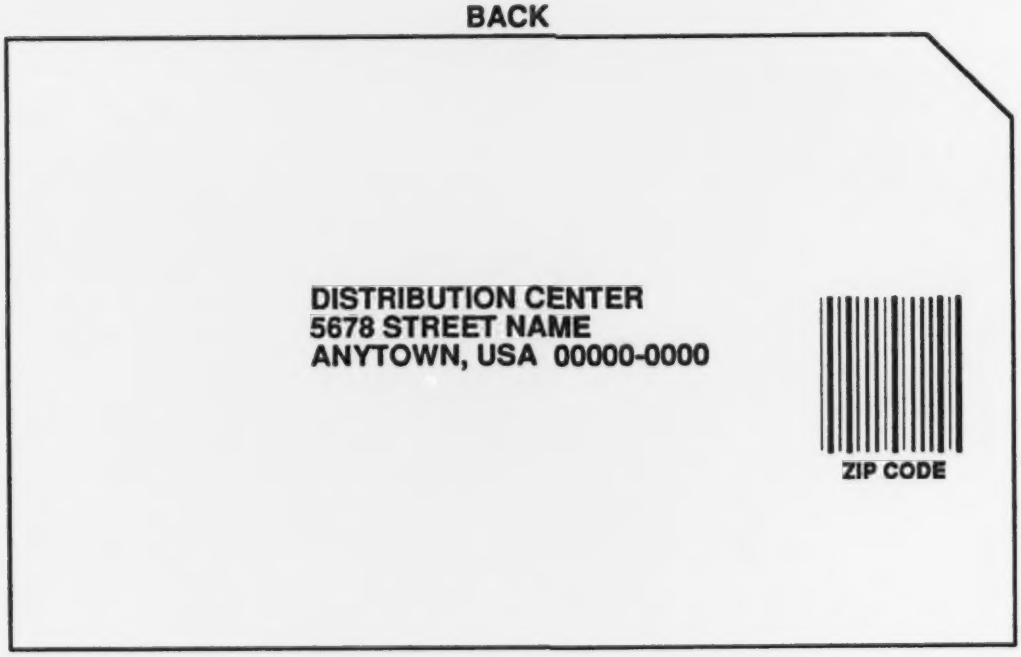
APPENDIX 3-8

PICK TICKET

FRONT



BACK



1200-6

SAMPLING OF PRESENT STORAGE DENSITY
UTAH STATE LIBRARY BRAILLE COLLECTIONS

Range Number	BR Numbers	Full Shelves		Partially Full Shelves		Empty Shelves	Total		Average Volumes Per Shelf
		Shelves	Volumes	Shelves	Volumes	Number of Shelves	Shelves	Volumes	
5	1994-2566	31	450	133	1209	4	168	1659	9.88
10	3855-4097	39	578	128	1174	1	168	1752	10.43
15	4877-5023	60	686	105	933	3	168	1619	9.64
20	5754-5869	71	837	94	800	3	168	1637	9.74
25	6499-6666	74	860	94	869	-	168	1729	10.29
29	7286-7472	60	750	105	857	17	182	1607	8.83
Total Shelves		335		659		28	1022		
Total Volumes			4161		5842			10003	
Average Volumes Per Shelf		12.42		8.86		-	9.79		

APPENDIX 4-1

APPENDIX 4-2

PRO FORMA RECEIVING, STOCKING AND SHIPPING STAFFING EASTERN DC					
Line No.	Work Element	Unit of Measure	Units Per Day	Minutes Per Unit	Man-Hours Per Day
1.0	Input Functions	-	-	-	8.60
1.1	Unload Hampers	Hampers	23	1.00	.38
1.2	Misc. Requirements Including Mail	Lot	1	10.00	.17
1.3	Open Receipts and Shelve	Volumes	1270	.20	4.23
1.4	Scan Shelves	Volumes	1270	.03	1.06
1.5	Bar Code New Volumes	Volumes	56	1.00	.93
1.6	Reconcile Irregularities	Irreg.	4	6.00	.40
1.7	P.F.&D. Allowance (20%)	Lot	1	20%	1.43
2.0	Output Functions	-	-	-	13.90
2.1	Load Hampers	Hampers	23	1.00	.38
2.2	Misc. Shipping Including Mail	Lot	1	10.00	.17
2.3	Pick From Front Shelf (60%)	Volumes	762	.17	2.12
2.4	Pick From Stacks (40%)	Volumes	508	.33	2.82
2.5	Pack & Scan	Volumes	1270	.25	5.29
2.6	Reconcile Discrepancies	Irreg.	8	6.00	.80
2.7	P.F.&D. Allowance (20%)	Lot	1	20%	2.32
3.0	Storage Functions	-	-	-	5.82
3.1	Load Stocking Cart & Scan	Volumes	508	.17	1.41
3.2	Putaway & Scan	Volumes	508	.33	2.82
3.3	Rewarehouse & Scan	Volumes	112	.33	.62
3.4	P.F.&D. Allowance (20%)	Lot	1	20%	.97
4.0	Custodial & Maintenance	Lot	1	30.00	.50
5.0	Total Man-Hours Per Day				28.82
6.0	FTE People @ 7.5 Hours Per Day				3.84
7.0	Minutes Per Copy @ 545 Copies Per Day				3.17

APPENDIX 4-3

PRO FORMA RECEIVING, STOCKING AND SHIPPING STAFFING WESTERN DC					
Line No.	Work Element	Unit of Measure	Units Per Day	Minutes Per Unit	Man-Hours Per Day
1.0	Input Functions	-	-	-	4.41
1.1	Unload Hampers	Hampers	12	1.00	.20
1.2	Misc. Requirements Including Mail	Lot	1	10.00	.17
1.3	Open Receipts and Shelve	Volumes	634	.20	2.11
1.4	Scan Shelves	Volumes	634	.03	.53
1.5	Bar Code New Volumes	Volumes	28	1.00	.47
1.6	Reconcile Irregularities	Irreg.	2	6.00	.20
1.7	P.F.&D. Allowance (20%)	Lot	1	20%	.73
2.0	Output Functions	-	-	-	7.06
2.1	Load Hampers	Hampers	12	1.00	.20
2.2	Misc. Shipping Including Mail	Lot	1	10.00	.17
2.3	Pick From Front Shelf (60%)	Volumes	380	.17	1.06
2.4	Pick From Stacks (40%)	Volumes	254	.33	1.41
2.5	Pack & Scan	Volumes	634	.25	2.64
2.6	Reconcile Discrepancies	Irreg.	4	6.00	.40
2.7	P.F.&D. Allowance (20%)	Lot	1	20%	1.18
3.0	Storage Functions	-	-	-	2.90
3.1	Load Stocking Cart & Scan	Volumes	254	.17	.71
3.2	Putaway & Scan	Volumes	254	.33	1.40
3.3	Rewarehouse & Scan	Volumes	56	.33	.31
3.4	P.F.&D. Allowance (20%)	Lot	1	20%	.48
4.0	Custodial & Maintenance	Lot	1	30.0	.50
5.0	Total Man-Hours Per Day				14.87
6.0	FTE People @ 7.5 Hours Per Day				1.98
7.0	Minutes Per Copy @ 265 Copies Per Day				3.37